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CANADIAN CHEMICAL JOURNAL

A Canadian Journal devoted to Metallurgy
Electro-Chemistry and Industrial Chemistry.

Vol. IV, No. 1 | TORONTO, JANUARY, 1920 | 25c. a copy.

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New E&A MacMichael Bulletin is now being compiled. Old Bulletin sent on request.

The Hortvet Cryoscope

This new freezing-point apparatus was also first shown at the 36th Annual Convention of the Official Agricultural Chemists. The official report on this instrument was made by Dr. Julius Hortvet, and his report is to be found in the official record of this meeting. The Hortvet Cryoscope has the following advantages:

1. It enables freezing-point determinations to be made in a short time—generally seven to eight minutes.
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Hortvet Circular, E&A Bulletin No. 268 sent on request.

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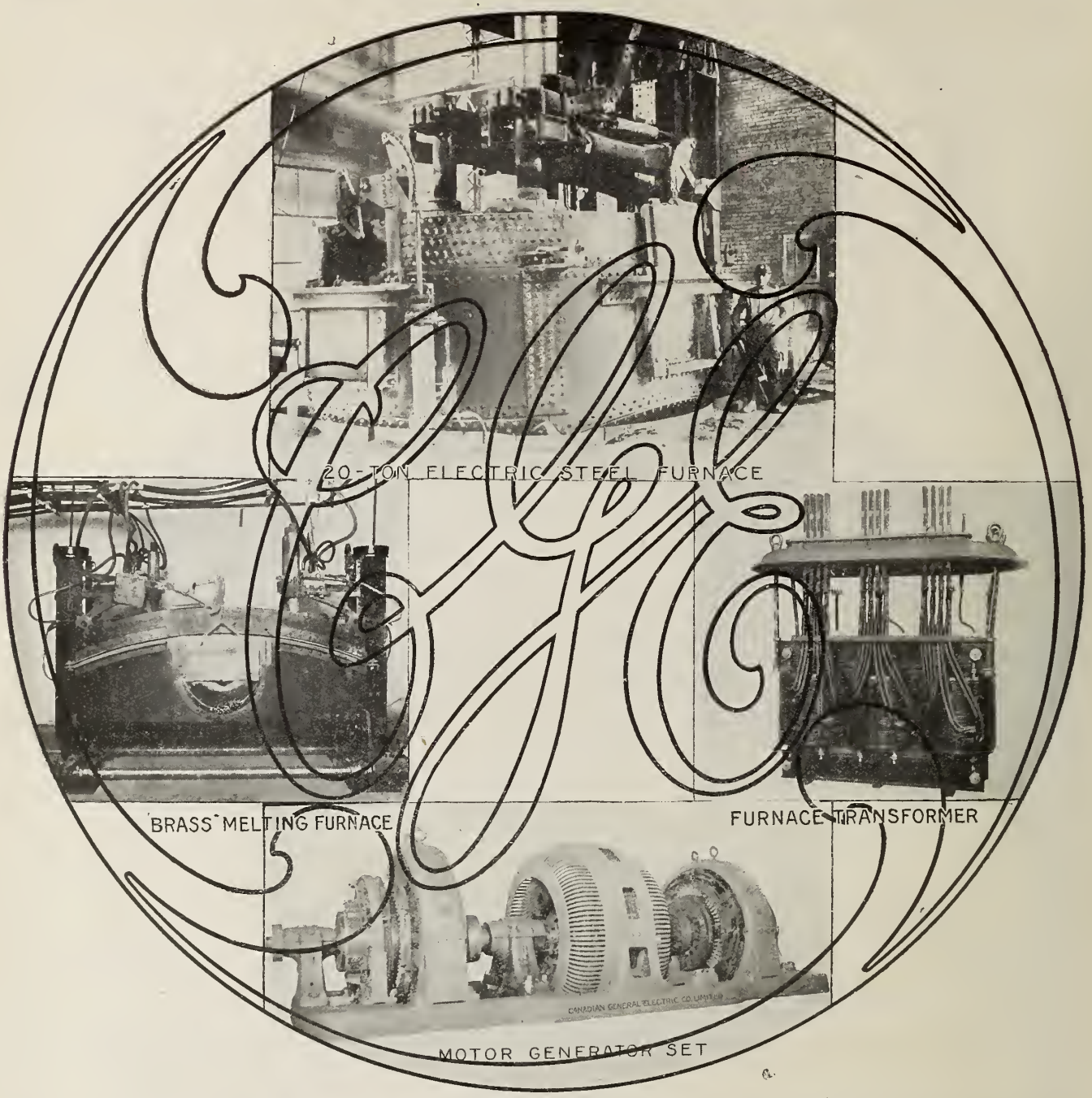

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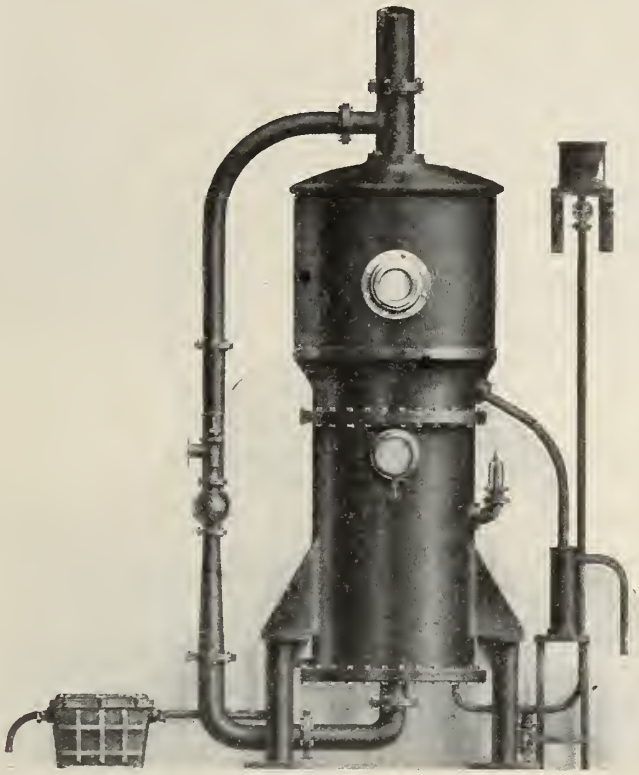

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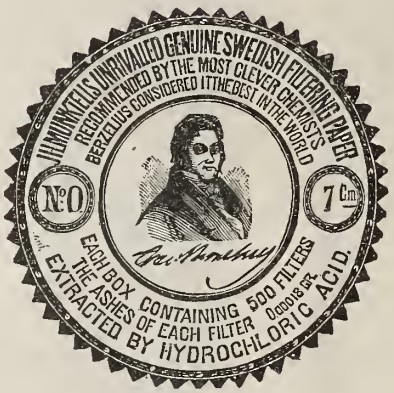
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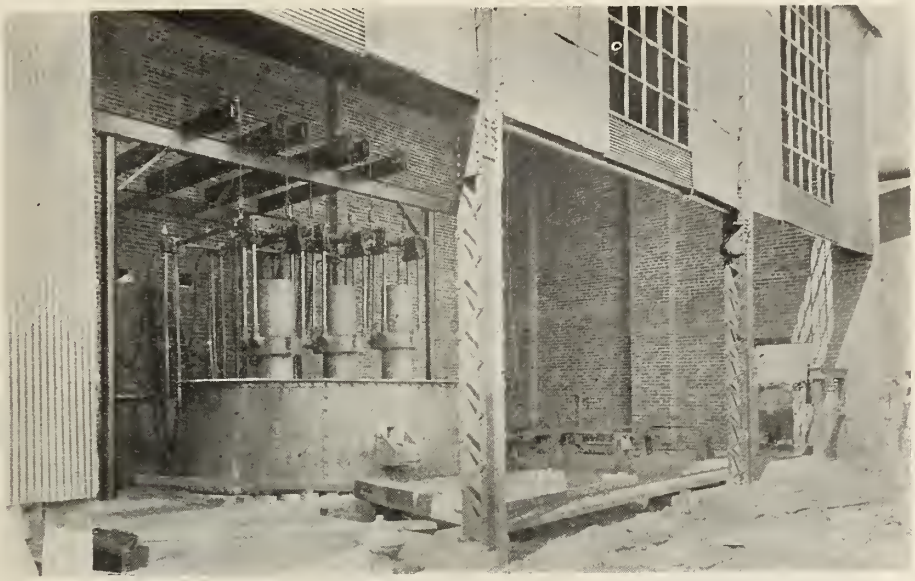

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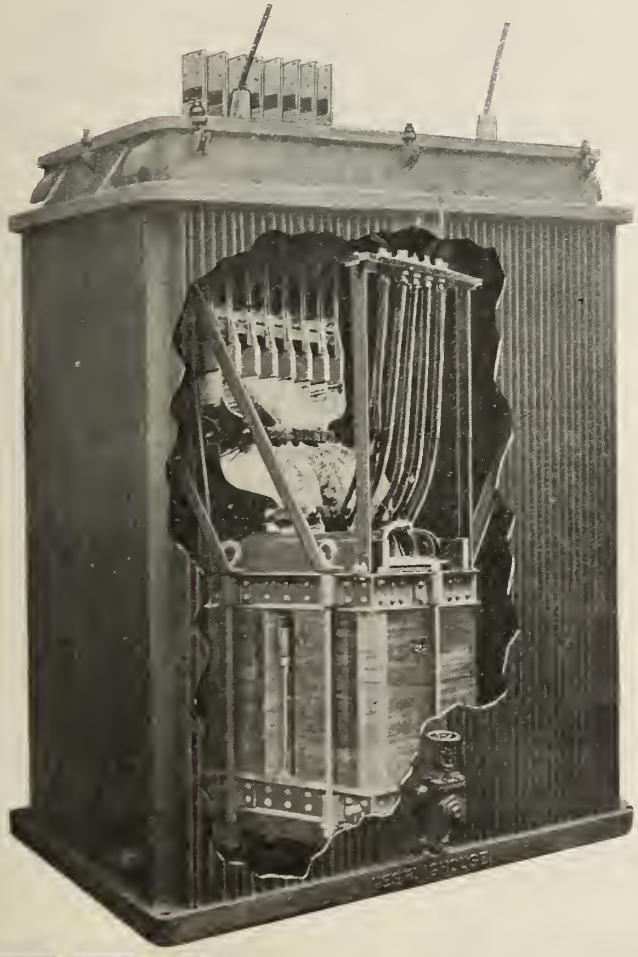

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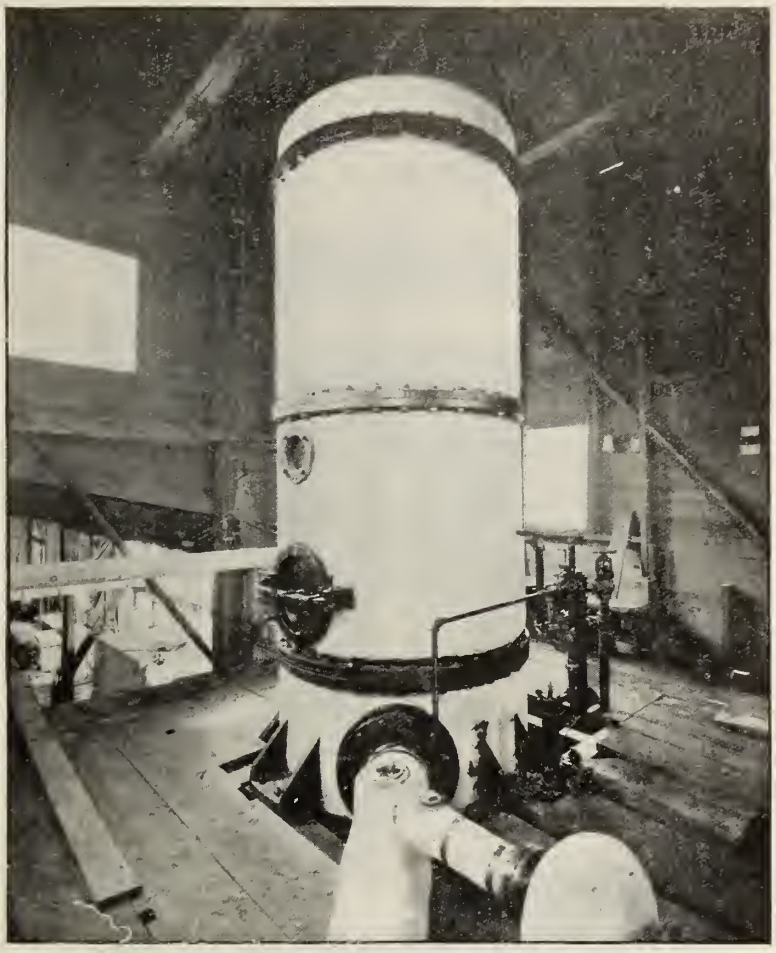

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WRITE FOR BULLETIN 106

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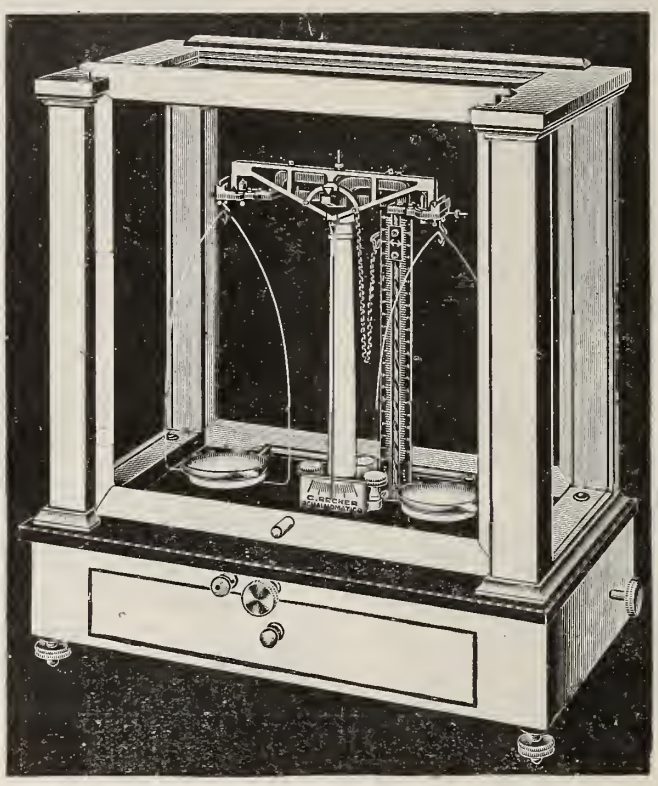

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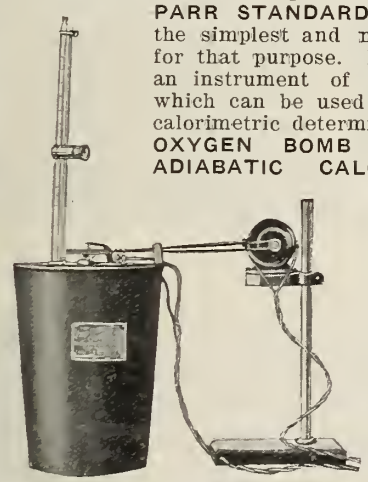

No. 2360.
For Complete Description send for Bulletin 73CJ.

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Or does he allow half of it to pass up the smokestack as unconsumed carbon? The U. S. Fuel Administration, through the Bureau of Mines, is strongly urging every plant to save fuel by securing as nearly perfect combustion as possible.

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The only check on the fireman is to measure the percentage of CO_2 in the flue gas and thereby determine the effectiveness of the firing. Such a determination involves the use of some form of gas analysis apparatus.

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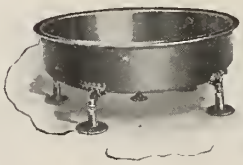

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Minerals: In 1918 Ontario produced 45 per cent. of the total mineral output of Canada. Practically all minerals, with the exception of coal and tin, are found in the premier mineral Province of Canada. Statistics of output, as compiled by the Ontario Bureau of Mines, show a valuation of $80,308,972. First among the metallics were nickel, silver, gold and copper. The total value of the chief metals produced in Ontario up to the end of 1918 is as follows:

Silver	$185,027,590	Nickel	$138,010,542
Copper	49,947,080	Pig Iron	78,925,917
Gold	50,864,863	Cobalt	5,918,899

Non-metallic products include actinolite, arsenic, barite, cement, clay and shale for ceramic industries, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lime, mica, mineral waters, natural gas, petroleum, quartz, salt, sand and gravel, stone for all purposes, and talc.

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1920

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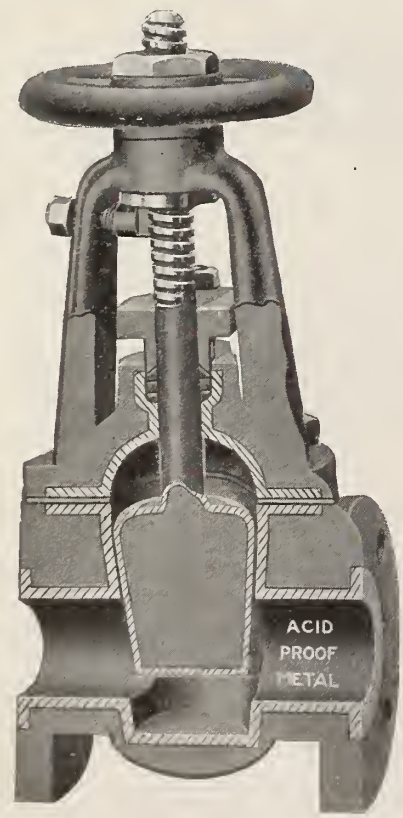

Announcement

There will be no change in our policy during 1920. As in by-gone years we will direct all our efforts to a large volume of business at small margins and a square deal to our patrons.

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CANADIAN CHEMICAL JOURNAL

A Canadian Journal devoted to Metallurgy, Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 TORONTO, JANUARY, 1920 No. 1

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Address all communications to The Canadian Chemical Journal, 72 Queen Street West, Toronto, Canada. Telephone, Main 7399.

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By T. A. Faust 8

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EDITORIALS

ON THE DISMISSING OF UNIVERSITY PROFESSORS.

At the present time there is taking place in connection with Saskatchewan University one of those remarkable struggles which seemingly are unavoidable to progress. The old order is endeavoring to restrain a rather undefinable situation by the simple expedient of casting out those members of the university family who, in their opinion, are likely to cause discord.

A university may not well be considered an ordinary organization, and the freedom of expressed thought is something that we can least afford to thwart in our universities.. Student bodies form debating societies, in which they destroy or build up governments during the course of an evening, and at which the most remarkable ideas, some idealistic and some absurd, are proposed. To a lesser extent, this freedom has always been considered the right of members of the faculty. But the situation at present existing at the University of Saskatchewan is one of more than ordinary importance, which should, and may easily have a most important bearing on the future of our great educational institutions.

The heads of four departments, including those directing the work in physics and chemistry, have been summarily dismissed by the Board of Governors, much in the same manner, and apparently with about the same degree of thought, that would be given to the dismissal of a foreigner from a street-cleaning department. Undoubtedly factors have entered into this action which have never been made fully public, but there is every evidence that before the matter is settled a complete investigation will be forthcoming.

Unless reasons existed sufficient to warrant the action of civil court procedure, it is hardly conceivable that any university authorities should take such action, and absolutely nothing of this nature has entered into the matter.

It would seem, then, that the true solution will more likely be found to be that these men were zealous in their work, and that the ambition they had for the growth of their departments, while practical to men of vision, was not understood and appreciated by those who are in control of power at the university. To a lesser extent, this has entered into the development of all our universities, but never has such drastic action been taken. More usually the men in the science departments have been able to overcome difficulties and in time the departments they have created have become a pride and a power to the province they represent. It is most surprising, also, that such a situation should arise in Saskatchewan, where it would be only natural to suppose that vision would not be lacking and that the provincial university staff should remain composed of leaders who were not afraid to attempt any goal.

The action of dismissal, from facts available, is certainly open to serious criticism, and the expressed feeling would indicate that the dismissed professors have been done a very great injury without due opportunity ever having been given them to make either a private or public defense of their position. The whole matter resolves itself really into a survey of the powers of a Board of Governors. Are they allowed to take drastic action in such matters, previous to a full hearing being given to those concerned? The position of the head of a university department is one which should be honored and the incumbent on precedent has rights which should be given the most exhaustive consideration before such action is taken. Without in any way lessening the powers of a Board of Governors, it still remains necessary for them, of all bodies, to act in a democratic manner towards the heads of departments. If, indeed, for causes which may be exceedingly hard to define, and which may well be open to dispute, any power may dispose of whole staffs, who are noted for their broad academic and industrial vision, there is but little inducement for progress and development in our universities. We can easily destroy life and initiative in institutions whose very function it is to create these unpurchasable products.

There is a principle involved here of the first importance. It must now be decided whether or not university professors are mere hirelings, of an arbitrary board, or whether they are conceived of more as judges, whose positions are free from popular attack. It is true that our University Acts state that positions are held at the pleasure of the Board of Governors, but the law of common sense in a democratic country usually induces all powers to back up their action with full and complete public statements, and the law of British justice allows no man to be professionally hung without some opportunity and time being given him to make a full defence.

Teachers everywhere should heed this case, which is by no means finished, and which has been taken up sympathetically by others on the staff of this university and by many graduates. Vested authority, when not used in a democratic manner, always builds up against itself an organization of the oppressed, which eventually destroys it, but, in the meantime,

good men are lost to good causes and progress is slow. Educational administrations in Canada may take heed lest they go too far on the assumption that worms will never turn, and we may be fast approaching a day when the meek and mild profession of university teachers, who have taught and lived in the joy of their work, may suddenly co-operate with demands that will stagger those who gather together on boards.

This is not the time when any university can play with heads of departments as many of them may well prosper more advantageously outside their university halls. It seems to be the general conviction that in the case of the particular men concerned, the university bids fair to lose much prestige if their departure is permanent, but it might easily be that in other fields of work their energy, vision and ambition may result in even greater benefits to the province of Saskatchewan and the Dominion as a whole.

ONTARIO AND COAL.

ONCE an idea becomes firmly established, whether right or wrong, it receives general acceptance, and while conditions may change entirely, most people will still think that something different is impossible. Most of us hope to live to see the day when the whole of Ontario will be supplied with coal, whether raw or treated, from Canadian mines. This is by no means the impossible dream it is supposed to be at present. Those who are perhaps best informed on this question have, at various times, outlined plans whereby this may reasonably become possible. Mr. F. W. Gray, editor of the Canadian Mining Journal, is perhaps as well qualified to speak regarding the possibilities of Eastern Canada coal fields as any one, following his long connection with the producing companies of Nova Scotia. He has recently pointed out what must be done to place this coal on a competing basis in Ontario, and the problem resolves itself into one of greater production, where costs are lowered, and ocean transportation to the Great Lakes. Those who remember the large fleet which, in former years, carried coal from Sydney to Montreal, should only consider this transportation factor trebled and it might be surprising how well our own coal would stand up against that otherwise imported. We are in a position where we may hope to reduce our costs on eastern coal by increasing production and by better water haulage facilities, but it is very questionable if American coal can ever be placed here again much cheaper than the present price. Besides these factors, there is every likelihood that carbonization plants will prove a factor and with these established along the St. Lawrence River, we have possibilities of the greatest importance.

From the other side, it would appear that a greater measure of co-operation on the part of mine owners in Alberta along with a fair amount of success with briquetting schemes, must eventually allow western coal not only to extend its market into the United States, but at least to meet competition at the head of the Lakes. These pictures are not dreams, but they will not come true very quickly if we do not realize that here is one place that by stopping the gap, we could save perhaps $100,000,000 on our trade balance in a year. With a hundred Canadian boats on the St. Lawrence, and a few more thousand miners in Nova Scotia, it might even surprise Buffalo where all the coal was coming from. Lest we should be forever begging, is it not worth trying for?

WATER SOFTENING.

ONE of the reasons frequently advanced in favor of a water-works system in a municipality, instead of the numerous wells, is that a single source of supply makes control as to purity easy and positive. Why should not the same argument apply to water softening? Municipal water softening is but in its infancy, yet it is sure to grow as soon as water users realize the ease with which the softening process may be carried out and the economy of operation.

The theory of water softening is not new. Temporary hardness of water is due to the presence of calcium and magnesium carbonates, held in solution by the presence of free carbon dioxide. The addition of lime water in proper quantities results in the union of the added lime and the free carbon dioxide, causing the precipitation of calcium and magnesium carbonates. Permanent hardness can be more economically treated by the use of lime and sodium carbonate. With so many Canadian municipal water supplies afflicted with hard waters, it is surprising that more thought has not been given to the problem.

Savings due to proper water softening are difficult to estimate. The following are a few of the more evident: A reduction in the plumbing bill; less hot-water, furnace, and tap trouble; less water is required, as results with softened water are more quickly attained; the saving in soap and the saving in wear and tear in washing of fabrics frequently amount to more than one-half the water rate. To these three may be a fourth—the saving in human life. Sickness is not so prevalent where you have a palatable, crisp, refreshing water, and a greater cleanliness is bound to prevail when you have a soft, clear bathing water.

Chemists and water-works experts have been too reticent in bringing before the water consumer the

advantages of a central softening plant. The manufacturer and the steam engineer have small plants at the factories; why not extend the system and develop a central plant? Some may urge that the water consumer is not asking for it. True, but usually he is taking what he gets because he does not know that something better may be secured.

Let the chemist show him.

MOLYBDENUM VERSUS TUNGSTEN IN STEEL MANUFACTURE.

ON December 18th last, newspaper despatches from London, England, indicated that Professor John Oliver Arnold, of Sheffield University, had invented a new steel, using molybdenum instead of tungsten. It is claimed that 6% of molybdenum will produce a steel as valuable in its properties of hardness as one containing 18% of tungsten. It is also said that successful experiments in the use of molybdenum in steel have been recently made in the United States and carried out successfully. However, according to the press reports, Professor Arnold, who occupies the Chair of Metallurgy at Sheffield, is patenting his invention both in England and America, but is prevented, under the Defence of the Realm Act, from publishing anything concerning it, as armaments still have the first call on hardened steel.

If these reports are correct, they naturally enhance the value of the molybdenum deposits of Canada, which are fairly extensive. The ferro-alloy industry in this country has suffered a considerable slump, following the termination of the war, and anything that will revive it and develop our molybdenum deposits would be commendable. One point, however, on which no data is supplied, and which must be taken into consideration, is the high cost and the difficulties of mining molybdenum, and we notice that one London despatch wisely modified its statement that "tungsten will take a back seat" by the conditioning clauses "if large quantities of molybdenum can be found and the price reduced." Two Ontario companies have been engaged for some time in the manufacture of molybdenum steel with considerable success, notwithstanding all of the technical difficulties involved. Professor Arnold's discovery, we believe, relates to using molybdenum on a large scale in the making of hardened steel, and, if such is the case, the discovery is an important one.

From data available it is hardly possible to judge whether the reported increase in the possible use of molybdenum will result in the active increase of Canadian production, but anything that might assist to this end should be thoroughly investigated by Canadian producers. Our war output of molybdenum may yet be put on a peace basis of some magnitude.

THE OIL OF WESTERN CANADA.

There has been so much written and said lately concerning the oil finds in Western Canada that it is very appropriate to quote from an address delivered by Mr. D. B. Dowling, of the Geological Survey, Ottawa, at the meeting of the Mining Institute held in Vancouver the last week of November. Mr. Dowling is one of the best-informed men in Canada on oil, and was exceptionally qualified to speak on the subject: "Oil Possibilities in Western Canada."

In his statement of conditions in the Peace River country, especially along the Mackenzie River basin, Mr. Dowling gave a very favorable report, saying that this area was very promising, and no doubt a large oil field. The problem of getting the oil out from the Mackenzie district would be solved, he said, as nothing was impossible now in the way of transportation.

Referring to the oil field directly south of Calgary, the speaker said that the production in that field last year was 13,000 barrels of oil, valued at $100,000.

As to the prospects of developing oil in British Columbia Mr. Dowling was not so optimistic. He intimated that the mouth of the Fraser River was the most favorable location for finding oil in British Columbia, according to geological deduction, but the formation was against the finding of oil in any large quantities in the province. Tertiary beds were being examined in the Flathead Valley and at the mouth of the Fraser River. In the southern part of the Rocky Mountains bordering on Alberta, seeps of oil, apparently from sediments of Cambrian age, were being studied with the view of tracing the origin of the oil. Oil shales were also found on Queen Charlotte Island, but the extent and value had not yet received much consideration.

THE PYROGALLIC ACID CASE.

A rather small matter in itself, but of importance in a general way, was the action of the British Government on the test case of the seizure of a shipment of pyrogallic acid from the United States. The British Government was declared by Justice Sir John Sankey to possess no power to prohibit the importation of certain goods, and therefore its proclamation was illegal. The Attorney-General has made application for appeal, as the judgment is considered one of the most important, as it affects the whole policy of foreign trade. War restrictions were presumed to be justified and legalized under an Act of 1876, which provided that certain goods may be prohibited by proclamation or Order-in-Council. The contention that pyrogallic acid was particularly a war chemical could not be well sustained by the Government. From the United States standpoint it now becomes possible to issue suit on cancelled contracts which were to the present protected by the British proclamation. The decision will likely be taken to a higher court, but it is remarkable what a general effect a decision one way or another may have, and pyrogallic acid has, as it were, become famous overnight.

UTILIZATION OF FISH WASTE IN CANADA.

Editor Canadian Chemical Journal: According to the most reliable statistics obtainable, and classing everything from sardine to whale as fish, Canadian waters produce 685,000 ton of fish annually. Approximately one-fourth of this catch consists of fish that are unfit for human consumption, and are, therefore, considered as waste. From

the remaining 500,000 tons anywhere from 20 to 25% must be deducted in dressing for market. Thereby constituting a total waste of 300,000 tons, a waste which can be readily and easily converted into marketable products, namely, fish meal, fertilizer, and oil. Undoubtedly you are aware of the tremendous demand for these products. Fish meal has been fed on the Pacific Coast for years, and it is now considered a necessity by the dairy farmers there. The mere fact that they pay $100.00 and over a ton for the product is sufficient proof of the demand. In 1916 the United States Department of Agriculture issued a bulletin, No. 378, to set forth the value of fish meal as a food for domestic animals and to encourage its manufacture and general use. In this pamphlet are reports of many interesting experiments, and it is interesting to note that in no instance was the flavor of the butter, milk, eggs, or meat affected by the feeding of the fish meal, and in each case there was a remarkable gain in profits, and in one instance as high as 94% for each pig.

Considering that the Canadian laws now compel lake fishermen to either bury or provide some sanitary means for the disposal of the waste fish, it is only natural to suppose that they turn to a method whereby a profit may be realized instead of an additional expense. The manufacture of fish meal fertilizer and oil surely affords this opportunity, and is, in fact, the only possible way of disposing of this waste at a profit. Consider the results to be obtained by the united efforts of these fishermen of the lakes, directed toward the utilization of this waste. To illustrate my point, we will figure on one (1) ton of raw material, composed of herring, entrails, eel-pouts, and spoiled fish. These 2,000 pounds of waste would produce 540 pounds of meal, worth $20.00; 260 pounds of oil, worth $30.00, totaling in all $50.00 worth of finished product, which, under favorable conditions, could be manufactured at a maximum cost of $10.00, thereby leaving a profit of $40.00 produced from 2,000 pounds of what was not only a waste but a nuisance.

Possibly a few only have ever thought of it, but it is a well-known fact that the meat packers of to-day are making their largest profits from what was formerly a waste and a nuisance, and were they to return to the methods used fifty years ago it would be utterly impossible for them to operate successfully with the competition of the present day. Returning once more to our subject of the fisheries, you will find conditions quite different, with the exception of a few concerns.

The process of cleaning and wasting fish has remained unchanged, some of our modern machinery proving even more wasteful than methods used in the past, particularly some of the modern high-speed machinery used in the salmon canning industry. I dare say that 40% of the salmon is wasted in this way. After a brief summary of these details, I am sure that you will realize that the fishermen of this country have not awakened to the possibilities of these great by-products of the fisheries.

Undoubtedly, the past four years have taught us something of the importance of conservation and utilization of our waste products. But, nevertheless, we are still behind the times in our methods of handling fish waste. There seems to be but one solution to the problem; every man engaged in the fisheries must investigate this most important branch of the industry and do his bit for the cause. The time has come for the individual fisherman to realize this undeveloped state of affairs and consider it not only an important part of his business, but his patriotic duty to supply this country with the much-needed fish meal, fertilizer, and oil rendered from this waste and nuisance.

Let us hope that the day is not far distant when the Canadian fishermen will supply the farmers of this great agricultural country with the fish meal and fertilizer manufactured from these 300,000 ton of fish waste, and that Canada will again show her resourcefulness by producing within herself a ten-million-dollar produce, which she now must purchase from other countries.

(Signed) ALFRED J. CURTIS,
563 William St., Buffalo, N.Y.

DECREASE IN COAL AND METALS.

The Department of Mines, Ottawa, estimates the production of coal in Canada during 1919 at about 12,500,000 short tons, as compared with 14,997,926 tons in 1918.

The production of the more important metals during 1919 is estimated as follows: Gold, $16,275,000 in value; silver, 13,500,000 ounces; copper, 81,500,000 pounds; nickel, 43,000,000 pounds; lead, 50,000,000 pounds; zinc, 38,000,000 pounds.

The 1918 production of these metals was: Gold, $14,463,689; silver, 21,383,979 ounces; copper, 118,769,434 pounds; nickel, 92,507,293 pounds; lead, 51,398,002 pounds; zinc, 31,580,800 pounds.

The total value of the mineral production in Canada during 1919 is estimated at $167,000,000. The 1918 production was $211,301,897.

THE PITTMAN ACT AND U. S. SILVER.

Although in 1918 the world's total production of silver showed an increase of about 16,000,000 ounces, yet the production at the present time is far below world requirements, and naturally the value advanced. India is reported to be buying in the China market. Great Britain has prohibited the export of silver bullion, but in the United States no such action will be taken, according to Director Baker, of the United States Mint. The United States is depending on the Pittman Act to regulate prices to a certain extent. This Act authorizes the Secretary of the Treasury to melt silver dollars to the extent of 350,000,000 to be sold as bullion. The United States Treasury statement on October 1 showed that the stock of money included 308,145,759 silver dollars, as compared with 568,269,513 on April 1, 1918. The reduction shows that 260,123,754 silver dollars have been melted, leaving 89,876,246 which the Treasury could still melt down before reaching the maximum figure named in the Pittman Act. As the United States standard silver dollar contains 371.25 grains of pure silver, the Treasury by melting the 89,876,246 silver dollars could obtain 69,513,660 ounces of silver, which is more than the production in the United States last year. According to Senator Key Pittman a further act could be passed to allow the continuance of turning coin into bullion, if it were considered necessary.

NATIONAL FUNDS IN PRIVATE BUSINESS.

The Anglo-Persian Oil Co. Amendment Bill, which recently received its third reading before the British House of Commons, touches Imperial policies in these lines. Capital in the Anglo-Persian Oil Co., to the extent of £2,500,000, is authorized.

In general, the problem is complex, as the navy must have oil and the Empire industries in general must be protected. At the same time, the British people are not anxious to be drawn into a position where, because of capital invested by the government in a private company, they may be called upon to protect an interest in Persia, for example.

The Development of a Graphite Industry, as Illustrated by the History of the Quebec Graphite Co., Ltd.

Brief History of Graphite.

THE mineral now known as graphite has been in commercial use for many years. Its true chemical nature consists only of the element carbon, and was first recognized as such by Scheels, 1742-88. Previous to this it was generally supposed to be "dead." and in those early days, on account of its distinctive marking on paper and porcelain, was shaped into crayons, and was called "lead pencil," hence this erroneous appellation for the article, which has still remained. The first discovery of its purest form was at Borrowdale in Cumberland, England.

Description of Properties.

Graphite, or "Plumbago," has a greyish black color with a metallic lustre, soft and soapy to the touch. It is a perfect conductor of heat and electricity, and is impervious to all acids or alkalies.

It also has an extremely low resistance to friction, and on account of its softness will find its way into the minutest pores in a bearing, making it run smooth and sweet. It occurs in the crystalline and amorphous forms. The former has several different forms of occurrence, hexagonal prisms, needle-shaped crystals, in foliated masses (often called "chip plumbago"), or flakes disseminated throughout the rocks of its occurrence. The amorphous variety more resembles a graphite shale, and approaches the true coal series. Thus there are three distinct allotropic forms of pure carbon—diamond, graphite and coal. The method of occurrence and physical properties of each are entirely different; where one is detrimental to lubrication, as in "carbonized" cylinders and bearings—graphite is used to eliminate it and cause smooth running.

Geology.

The ores of the Buckingham district are chiefly of the flake variety. The country rock is a crystalline limestone of the Grenville series, interbanded by a complex of pyroxine gneisses, gabbro, pyroxine diorite, proxine syenite and pegmatites composing the Buckingham series.

The whole mass is intensely deformed and twisted, and there is a great enrichment of graphite at the contacts of the pegmatite intrusions, the ore occurring in distorted lenticular masses, flakes of graphite can be traced far into the limestone on either side of the ore bodies. These ore bodies average from 12% to 16% carbon.

Graphite was mined from the Buckingham district as far back as 1845, and from then to the present date an enormous amount of money has been spent, much thought and originality has been shown, in trying to solve the problem of graphite concentration in this district. Some extraordinary difficult features are presented, chiefly because the specific gravity of graphite, which is 2.25, is only slightly less than that of its accompanying gangue, which is from 2.5—2.7, and the natural shape also tends to aggravate the problem. Dry methods of concentration, with their accompanying inconveniences from dust losses and difficulties of operation, were always carried on. While all due acknowledgment is to be made to the pioneers of the industry, it must be granted that the commencement of operations by the Quebec Graphite Co., Ltd., who used wet concentration, marks one of the first milestones of progress in this direction.

History of Quebec Graphite Co., Ltd.

The present mines and mills of the Quebec Graphite Co., Ltd., are situated about four miles east of Buckingham, P.Q., on lots 1-4. This property was taken over by the British Company from the Natal Company, who obtained it from H. E. Dixon, of Ottawa. During 1910 and 1911 a parcel of graphite ore was sent from lot 3 to the works of Fried Krupp, Madgeburg, Germany, and after a long series of experiments, what was supposed to be a satisfactory process of concentration was evolved. This process was on the wet gravity lines, its outstanding features being very careful classification and a unique finishing plant.

The Quebec Graphite Co. was thus formed in London to work the contemplated process. Its capital was £100,-000.00, and building and mining operations were begun in 1912. Owing to climatic conditions, non-arrival of parts, and scarcity of labor, installation of the plant, which was entirely under German jurisdiction, was not completed till September, 1913. The machinery was all German, and consisted of initial crushing and grinding units, sixteen gravity tables, classifiers, dewaterers, dryer and finishing plant. Power was supplied by a 160-h.p. Diesel oil engine.

It was expected that the rough concentrate would run about 80% carbon, which would then be brought up to 90% carbon by the finishing plant. No time and money had been spared in the installation, and on September 26, 1913, milling operations were begun. At an early date defects in the initial crushing and grinding installation were noted. A rough 80% concentrate could not be produced, and the recovery also was unsatisfactorily low; furthermore, the plant was designed in a country where labor was cheap, and consequently the enormous amount of man-handling and disregard for labor-saving devices in this mill tended to make milling costs very high. Also the drying apparatus was hopelessly inefficient. Thus the contract of the German firm was not fulfilled, and the German engineers left the scene of operations before the accomplishment of their task, and with the usual "promises" of better improvements. Had the company known that nation as they do to-day, they would have at once severed all connections with them. However, further experiments were initiated at Krupp Works with the object of overcoming these defects, and it was again "supposed" that a satisfactory solution had been found. Meanwhile the plant had run through the winter, but was finally closed down for readjustments on June 17, 1914.

Work of dismantling proceeded, some of the new machinery was sent from Germany, arrived, and was installed, but some was not shipped at the outbreak of the war in August, 1914. At this period the company's finances, due to the investigations and alterations, were becoming strained. British treasury regulations and a moratorium in England, made it difficult to raise further funds, and all work was finally stopped early in September, 1914, and the company went into voluntary liquidation early in 1915,

and was reconstructed under the name of The New Quebec Graphite Co., Ltd.

The new company restarted operations on July 19, 1915, and the work of remodelling the plant was resumed. The old plant, with the missing units still in Germany, was repaired and tuned up as well as possible, and a test was run in the end of September, 1915. This was fairly satisfactory, but the management considered the mining outlook very unpromising, as at that date no deposits of value were developed, and practically no ore was in sight.

The works were therefore closed down again until April, 1916; all German superintendents and interests were displaced, and Mr. R. C. Rowe and Mr. C. N. Daly, who had considerable experience in mining and milling graphite in this district, were appointed as works managers, and operations were again resumed. It was felt that defects in recovery would be in some measure offset by the increased price of graphite, and it was the company's policy to return any profits into development of the property and investigations for improving the milling process. For a period of two years under this new management the plant ran steadily and productively. A definite scheme of prospecting was followed, and new and highly promising deposits were uncovered and developed, and indications of almost unlimited quantities of ore were shown to exist. During this period investigations into increasing the efficiency of the plant were also conducted.

The impossibility of obtaining spare parts for the German machinery was a heavy strain. Every part, therefore, no matter how small, had to be drawn, patterns made, and specially cast, deliveries were bad and irregular, and consequently the efficiency of the plant suffered. Moreover the old inherent defects were still present, in spite of the German "promises," and this, coupled with the ever-increasing cost of supplies and labor, caused cessation of operations in April, 1918. After this date the company turned its attention very seriously to improving the recovery of values in the concentration plant. Investigations in flotation concentration of several different processes were conducted in Canada, U.S.A., and in England. But the strain of these continued investigations was, however, too great, and the company again went into voluntary liquidation.

In June, 1919, the British Company again decided to start afresh, with drastic alterations and new ideas; and this new company was called The Quebec Graphite Co., Ltd., head office at 4 Fenchurch Avenue, London, England. Mr. V. L. Eardley-Wilmot, recently returned from the army, a mining engineer from British Columbia, was appointed general manager, who, after preliminary investigations in England, came over to reorganize and start operations on a new scale. After careful study of the latest methods of ore concentration both in Eastern and Western Canada, and exhaustive tests and experiments, the present and latest method of graphite concentration was decided on, both in consideration of its efficiency and for the reasonable cost of plant and engineer fees.

The results of these experiments with this new process have proved that the very highest grades of both coarse and fine flake graphite can be produced from the company's property at Buckingham. The company is very much indebted to the invaluable assistance given to them by the Mines Branch at Ottawa.

Remodelling of the mill on these new lines started during August, 1919, directly under the supervision of Mr. R. C. Rowe. The old Krupp process has been definitely discarded. The initial crushing and grinding plant has been entirely reconstructed with the latest mills. The dewatering and drying equipment has been altered, and additions have been made to the already highly efficient finishing plant, and it is hoped that the company will be able to sell some of its discarded units.

The economic geology of the property in the vicinity of the mill has been investigated, and further exploration has revealed a large ore body of the highest grade that has been milled in recent years. The company's property is very extensive, and is permeated throughout with the best Canadian flake, and several years' supply of ore can be obtained from the small portion prospected, while a close study of the geology shows that at least seven-tenths of the property, which has barely been walked over, must contain an almost inexhaustible supply, and there is therefore not the slightest doubt that the company will now reap the benefit of their long-continued and persistent enterprise.

Commercial Products.

From some of the extremely high-grade coarse and fine graphite produced all manner of commercial products are being manufactured. These to be immediately put on the market are:

(1) A high-grade coarse crucible flake, 90% carbon, and mica free.
(2) Several high grades of powdered lubricants, in cans, for all kinds of machinery and automobiles.
(3) Fine flake graphite.
(4) Foundry facings for all purposes.
(5) Graphite dust.

A complete line of graphite products is also now being experimented on, amongst which may be listed graphite greases of all grades, stove polishes, graphite paints, pipe and boiler compounds. Experiments in the manufacture of electrodes and electric materials are under consideration.

The company expects to establish at least one factory in Canada and one in England for manufacturing these products.

The management has the advantage over other graphite properties, in that it possesses what is the crux of the situation, in the form of the very highest grade finishing or polishing rolls, and these, in combination with the last word in graphite concentration, enables them to be able to economically produce all the above products at a considerably reduced price on the present imported goods. The company is also fortunate in having a very sound financial backing in their British directors, who are among the best-known business men in London, England.

The idea has been prevalent that Canadian flake is not as good as Ceylon, but this has chiefly been in the past a question of purity, and by recent methods of concentration and finishing it has been shown that the Canadian flake in its pure state can hold its own, for any purpose, against all outside grades of this mineral. The managers are all thoroughly experienced in graphite and its concentration, and being alive to their opportunities, the new industry should branch out into almost any proportions. The market will not be confined only to this continent, for negotiations are already under way for disposal of products throughout Europe and the Far East.

Note.—Published with the permission of V. Eardley-Wilmot, General Manager, Quebec Graphite Co., Buckingham, Quebec.

Chemistry in the Leather Industry

The Development of Modifications in Methods of Tanning Through the Application of Chemical Principles in This Industry.

By T. A. FAUST

SEVERAL years ago the following note appeared in one of the lather trade journals, under the title, "Ask the Chemist":

"When the leather goes wrong, ask the chemist. That's the real rule of tanning these days. Time was when, the leather going wrong, the boss and his friends held an inquest on it, thumbed it, chewed it, and discussed it, and then burned it and tried their luck again; but these days, if the leather goes wrong, the boss hurries a few specimens of it to the chemist, who gets out his glasses, his test tubes and his acids, and studies the leather like an auditor studying his books, until he finds out what is the matter with it. Then he tells the boss, and the boss guides his next tannage accordingly. It costs a bit, perhaps, to call the chemist, just the same as it costs a bit to call the doctor, but it saves a lot of time, money and worry in the long run."

The above article was severely criticized by the President of the American Leather Chemists' Association, who commented as follows:

"This is the wrong view of the value of the chemist. Why wait until the patient is about to die before calling in the doctor? Doesn't it seem wiser to let the doctor keep in such close touch with a patient as to be able to detect any serious disturbance of his system, and thereby avoid the resulting illness? The true and most valuable function of the chemist is to follow the processes of manufacturing by the aid of his knowledge of 'chemical control' so as to detect harmful conditions and to take measures to prevent the 'leather going wrong' long before the tanner suspects that everything is not right."

The above is illustrative of the chemist's role in the tanning industry. Twenty years ago, before leather chemistry was born, the tanner worked by rule of thumb, and, as we know to-day, such a rule is very uncertain. Consequently, oftentimes leather was ruined, and many a pack was thrown under the boilers, even in the days when fuel substitutes were not necessary.

Some years later, after the chemist had appeared on the horizon and began to make his influence felt, it was customary to resort to the chemist when things were going wrong, and to let him severely alone when everything seemed to be normal. However, this has again changed, and to-day every progressive, up-to-date tanner avails himself of the services of a chemist, not to pull him out of trouble, but to keep him from getting into trouble.

Dr. Henry Proctor, of Leeds, England, is recognized as the father of leather chemistry, and is considered to-day as the greatest authority on this subject. There are a number of chemists in the United States and Canada who went to the University of Leeds during the last twenty years to work under this great respected scientist, and these men are to-day among the leaders of this branch of industry.

Organization of Leather Chemists.

About 1900 there were eight or ten young chemists in the States who began to delve into this subject, and in 1905 they organized themselves into what is known to-day as the American Leather Chemists' Association. At present this organization numbers about 170 active members and 230 associate members. The active members are leather chemists practising their profession, whereas the associate members are tanners and men connected with the allied industries. We have, therefore, in this association a linking together of the chemist and the practical man which has worked out very satisfactorily; furthermore, this association is an American association in the true sense of the word; that is, it is not confined to chemists from the United States, but consists of members from both the United States and Canada, all of whom are working for the advancement of the leather industry in general. At present there are about twenty-five Canadians who are members of this association.

Canadian Leather Laboratories.

The tanners of Canada have appreciated the value of the chemist for many years. Three or four of the larger concerns established their own laboratory between five and ten years ago, and many of the other concerns have availed themselves of the services of the independent leather trade laboratories, of which there were several established shortly after 1900 in the United States. In the spring of 1916 the first leather trade laboratory was established in Canada, and it was welcomed with open arms by the general leather industry. To-day, while there are only about five tanners who conduct their own laboratories, nearly every concern in the Dominion is sending samples and having work done in a fairly systematic manner.

The tanners in this country are progressive; they have long since realized the value of the chemist's analysis, and, what is much more important, the chemist's opinion, and it did not take the war to bring them to this realization, as was the case with a great many other Canadian industries.

While this article will not go into the matter of leather manufacture, in order to give an idea of what part the chemist plays in the industry it is necessary to give the readers a brief description of the tanning process.

Methods of Tanning and Processes.

There are two principal methods of tannage, the bark, or vegetable, and the chrome. The bark, or vegetable tannage is used on nearly all heavy leather, such as sole, belting and harness leather, and to a considerable extent on heavy upper leather, such as cow-hides and kips. Chrome tannage is used altogether on goat skins, producing kid leather, and very largely on calf skins, producing the finer grades of shoe leather. It is also used by one concern in this country for sole leather. The chrome tannage is further divided into two kinds, the one-bath and the two-bath.

There are three general processes necessary for practically all leather, regardless of the tannage, namely, first, depilation, that is the removal of the hair and the preparation of the stock for the second procedure, which is the tannage proper. The third step is the finishing.

Duties of the Leather Chemist.

The chemist has three duties to perform, as follows:

First, the analysis and examination of all raw materials: Tanning materials are sold on a strength basis, and, in addition, must be maintained at a certain purity. By the use of materials under strength or adulterated, the tanner

can readily damage thousands of dollars worth of stock, and it is absolutely necessary that he knows that the purity and strength of his tanning materials are up to the standard of his requirements.

Second, Control Work: Every one of the major operations mentioned above embrace a number of minor procedures which must be carefully manipulated. Before the chemist arrived on the scene, the only way the tanner could tell if his raw materials were wrong or if his process was wrong was to see stock coming through that was not right, and which was, consequently, a serious monetary loss to him. To-day, however, he can have his raw materials checked, as mentioned above, and, furthermore, he can have his tanning liquors tested periodically to see that they are in the proper condition for his stock at that particular stage of the operation. The chemist can see from his analysis if the tanner's solutions are beginning to get too strong or too weak, or in any other way are not in the proper condition, before the tanner can see the effects on the stock; furthermore, in this way, the tanner is advised of the defect in time to make the necessary changes in his procedure to avoid any trouble.

Third, Research Work: This can be divided into two headings, namely, true research work and experimental research work. There are to-day many chemists investigating the basic fundamental principles of the industry. The National Association of Tanners in the United States, now known as the Tanners' Council, started a research laboratory several years ago, and the chemist in charge is working on various phases of this subject. In addition, several of the larger companies in the States are doing work of this nature, and several of the candiates for doctor of philosophy degrees at Columbia University have also published some valuable theoretical information.

Experimental research work is the more practical application of the true research findings to the industry, and, in addition, under this heading comes the development of newer process and materials.

Use of Newer Tannages.

Twenty years ago tanning in Canada was practically all done with hemlock bark, but as the hemlock forests have become depleted it has been necessary to utilize other materials, and the chemist has played an important part in finding for the tanner suitable material for his requirements. To-day there is probably less than 20% of hemlock bark used, and the remainder consists principally of extract of various tannin-bearing woods and barks. Furthermore, by the judicious use of mixtures of these various materials, the tanners are able to-day to produce as good a quality of leather as they did formerly with hemlock bark. The chrome tannage is much more recent than the bark tannage, and the chemist has developed this process right from the start; moreover, due to his perseverance, the chrome tannage is to-day so well standardized that, with any reasonable amount of caution, it is not difficult to get excellent and uniform results. Many instances could be told of new processes and procedures which the chemist has devised, not only because it was necessary to make certain substitutes for materials used previously, but also to improve the quality, appearance and the saleability of leather.

We hear remarks frequently that leather to-day is not as good as it was a generation ago. This idea is analogous to the statement of the man who says we do not have the winters that we had when he was a boy. Statistics prove conclusively that the winters have not changed materially within the last several generations, and it is merely a case of first impressions being the most lasting ones. Leather produced to-day is equal, if not superior, in quality to leather produced a generation ago, and is certainly improved in appearance and general usefulness.

Canadian Leather Not Surpassed.

In conclusion, the writer wishes to call the attention of the reader to the fact that Canada produces leather absolutely equal in quality and appearance to that imported from other countries. This should be particularly borne in mind to-day in view of the present exchange situation. At the time of this writing there is a strong "Made-in-Canada" boom, and users of leather are not going to suffer by getting behind this movement. The writer's occupation has been such that he has been in a position to get good comparisons between Canadian leather and other leather, and he is absolutely of the opinion that the grade of most leathers being produced to-day in the Dominion is fully up to the standard of leather produced in any other country. Furthermore, the shoe industry in Canada has progressed, and, barring freak styles, Canadian manufacturers to-day are producing shoes as fine as one desires and strictly up to the prevailing fashions of the day. It may surprise the reader to know that high-grade Canadian-manufactured shoes are being offered and sold at present in New York City. Canadians should insist on buying Canadian-manufactured shoes and leather products of all descriptions, not only on account of the economic necessity of so doing, but also in view of the fact that they will get just as good an article, and just as stylish and up-to-date, as if they bought the imported article.

YOCUM FAUST, LIMITED, London, Canada.

POTASH FROM SUGAR BEETS.

While the content of potash in the sugar—but it is not large, the present shortage and high price make the recovery of it commercially feasible. The potash is obtained from the waste water solution which is left at the completion of the first step in the sugar manufacure. The solution is evaporated and when the residue is burned, the ash which is left contains 3 per cent. potash. United States Soil Improvement Bureaus estimate that in the State of Colorado alone, 4,000 tons of potash are available annually from sugar-beets. The interesting point about this calculation is that the sugar-beet crop in the State of Colorado requires 4,000 tons of potash to manture, or in other words, since the bureau estimates that 4,000 tons of potash could be obtained, it therefore follows that the beets must have extracted that amount from the soil, which is indeed a rather heavy depletion, and one that must either now or in the very near future be replaced by fertilizers containing potash.

POSSIBILITY OF BAUXITE IN B.C.

There is still an impression among prospectors that Chas. Camsell, head of the British Columbia Branch of the Geological Survey, had definitely made a discovery of bauxite in this Province. The fact is that Mr. Camsell brought to British Columbia samples of Georgia bauxite in order to interest prospectors here in search for the mineral. He believes there is a possibility of its being found in the interior plateau region, especially in the decomposition product of some of the later lava flows. Mr. Camsell left the samples he brought out at the Vancouver Chamber of Mines so that they might be examined by prospectors desirous of familiarizing themselves with the mineral.—*Mining and Engineering Record, Vancouver, B.C.*

PROGRESS OF DEVELOPMENTS IN NORTHERN MANITOBA.

The progress that has been made in the developing of the mineral claims of Northern Manitoba has been described by Dr. R. C. Wallace, Commissioner of Northern Manitoba, in the *Mining and Engineering Record* of Vancouver, B.C. It will be remembered that in the November issue of the Canadian Chemical Journal the development of the large Flin-Flon copper mine was outlined. The situation in this territory is well summarized in the general conclusions with which Dr. Wallace closes his article, which are as follows:—

(1) The work of the past five years may be characterized as very successful prospecting. In order that successful mining may ensue, railway transportation is essential. Until such transportation is provided, mining operations will be difficult on the gold properties and impossible on the copper properties in the western section of the district.

While the extent of the Flin-Flon property in itself amply justifies the building of a railway, it is very desirable, from the point of view of the mineral belt as a whole, that that railway should cross the belt east of Lake Athapapuskow and reach the property from the east, and in this way place a comparatively large section of the mineral belt in direct touch with transportation. When negotiations are finally concluded on the Flin-Flon property the building of the railway cannot be any longer delayed.

(2) While in the search for copper properties no discoveries have yet been made comparable to the Flin-Flon and Mandy properties, prospecting has revealed a very widespread occurrence of copper sulphides throughout the mineral belt, and more particularly on the western section. There is, therefore, ample encouragement for still further and more detailed prospecting for copper ore bodies in the mineral belt, and in certain instances, for the expenditure of capital in the underground prospecting of properties already obtained.

(3) As far as gold mining is concerned, interest now centres more especially on unusually large gold-bearing quartz lodes and silicified zones in the Copper and Herb lake districts. Much money will require to be spent on the underground prospecting of these and similar large properties. With the stimulus which gold mining is now experiencing throughout the continent, it cannot be doubted that the money will readily be spent by such mining corporations as are desirous of acquiring ore bodies of large dimensions with sufficiently high surface values to justify underground prospecting on a large scale.

(4) Throughout the belt the iron sulphide bands are remarkable both in respect of distribution and width. Such bands have been cross-channel assayed only to a very limited extent. Because of their extent, and also because of the fact that fairly wide quartz lodes are here and there closely associated with the iron sulphides, careful attention should be paid to these occurrences, in order to determine whether sufficient quantities of copper, nickel, gold and platinum are present in any such occurrences to make operations profitable on a mineral body of large dimensions.

(5) It cannot be too strongly emphasized that the staking of claims must be followed by, and indeed preceded by, intensive prospecting, if good results are to follow to the district as a whole. In certain areas the actual work done is as yet entirely incommensurate with the amount of territory which, being already staked, is no longer available for prospecting by anyone but the owners of the claims. The regulations with regard to staking and assessment work are very favorable, and not the minimum but the maximum of work will always be done on the claims recorded by those who keep the welfare of the district closely to heart.

DATA ON CANADIAN PLANTS USED FOR TANNING.

Mr. J. Adams, Assistant Dominion Botanist, has recently issued the following note on Canadian Sources of Tanning Materials:

The essential feature in tanning is the precipitation of gelatine by the chemical substances to which the general term "tannin" is applied, as the result of which hides become leather.

The tannins are of very wide occurrence in the vegetable kingdom, and occur in almost all parts of the plant, but not always in sufficient quantity to be of commercial importance. In the plant known as Canaigre (*Rumex hymenosepalus*), which is really a species of dock occurring in Texas, it is found in the root; in many trees such as Hemlock it occurs in the bark; in the Sumacs it is abundant in the leaves; while in still other plants is is found in the fruits or in certain pathological growths known as "galls," such as those on various species of Oak.

Among plants growing wild in Canada which contain tannin in considerable quantities are the following species: Hemlock (*Tsuga canadensis*) yields nearly 14 per cent. of tannin; the bark of White Spruce (*Picea canadensis*), Tamarack (*Larix laricina*), and Balsam Fir (*Abies balsamea*) contains 7 to 14 per cent.; the bark of Chestnut Oak (*Quercus Prinus*), White Oak (*Quercus alba*), and Red Oak (*Quercus rubra*) yields 12 to 15 per cent.; the wood of American Chestnut (*Castanea dentate*) yields 8 to 10 per cent. of tannin, while the stems and leaves of different species of Sumac contain 16 to 24 per cent.

The Horse Chestnut (*Aesculus Hippocastanum*), although not a native of Canada, is fairly hardy at Ottawa. Its bark yields a considerable quantity of tannin, while analyses of the leaves made in different months of the year showed a percentage varying from 2 to 6½ per cent.

While the barks collected in May and June are said to contain the largest amount of tannin, further investigation seems to be necessary before the point can be regarded as finally settled, as the analyses that have been made of some species do not seem to bear out the above statement.

Increased attention is being devoted at present to the Sumacs as a source of tanning materials; in this group it is not necessary to destroy the tree, as the leaves and not the bark are used. There are three Canadian species whose leaves furnish tannin in considerable quantities: Dwarf Sumac (*Rhus copallina*) occurs in Southern Ontario, White or Smooth Sumac (*Rhus glabra*) extends from Nova Scotia to British Columbia, while Staghorn Sumac (*Rhus hirta*) is found from Nova Scotia to Ontario.

The best time to gather the leaves is during the months of July, August and September. The branch of the current year should be cut or broken in such a way as to leave a few buds at the base to continue the growth next season. The leaves contain a much greater amount of tannin than the stems. Green Sumac loses 50 to 60 per cent. of its weight in drying.

The price paid for cured Sumac in the United States varies from 60 cents to $1.10 per 100 pounds, according to quality.

Canadian Magnesite Industry

Notes on the Development of the Magnesite Industry in the Dominion, with Reviews of the Operations of Leading Companies*

By W. C. PHALEN

SPATHIC magnesite is the term often used to designate those carbonates of magnesum which are free from carbonate, or contain less than 5 per cent. of this constituent. It may greatly resemble crystalline limestone and dolomite, and sometimes only very careful tests can differentiate magnesite from marble or crystalline limestone as the term "marble quarries" applied to the different deposits indicates. This is also true of the Canadian deposits. Dolomite often has a dull appearance on fresh fracture, somewhat resembling that of chert, and it also has a very characteristic mode of weathering. These characteristics enable one, with a little experience, to differentiate it with considerable success from true magnesite.

Location.

Important deposits of spathic magnesite are found in the Grenville-Harrington district of Argenteuil County, Province of Quebec, Canada. This district is situated about 50 miles west of Montreal, on the north side of Ottawa River. Shipments are made over the Canadian Pacific Railroad, either by way of Montreal, where some of the ore has been calcined by the North American Magnesite Company, or to the west over the same road via Hull and Ottawa. Considerable ore has been calcined by the Scottish Canadian Magnesite Company at Hull.

Associated Rocks.

The magnesite is associated with metamorphic sedimentary rocks, such as crystalline limestone, garnet gneiss and quartzite, in close proximity to pyroxenic rocks. The magnesite is found in large masses with bands of dark green or light yellow serpentine. The serpentine is disseminated in the magnesite in places, and the magnesite nearly everywhere contains more or less dolomite. Throughout much of the deposits, the magnesite and dolomite are so similar in appearance that the presence of dolomite is difficult to detect.

The prevailing lenticular form of the deposits is noteworthy, in which respect they are not different from the massive beds of Washington. They are supposed to have been formed by the replacement of limestone by magnesium bearing solutions, and, in this respect, are in the same general class as the Washington deposits and those of Austria.

Notes on Mining.

In mining the magnesite on most of the properties, the ordinary open cut quarrying methods, with boom derricks and hoists, were employed. The large masses of serpentine and dolomitic material encountered in the pits are loaded on to cars, and transferred to the dumps directly. The magnesite, on the other hand, was transferred to cobbing platforms, where it was broken and cobbed. The color and appearance of the material assists the quarrymen in their work. The dolomite is a dull white or coarsely crystalline. Cream white to glistening magnesite of medium to fine grained texture contains, as a rule, less than 7 per cent. of lime, whereas the pure white variety contains more lime—up to 11 or 12 per cent.; and the grey variety, still more. Laboratory tests have shown that after calcination, the dolomite slakes to a smooth paste, and may be washed away, leaving the purer magnesite.

*Abstracted from report of the United States Bureau of Mines.

Canada Reserves.

Though the magnesite everywhere includes some dolomite, the drilling and development work have shown that extensive masses of magnesite are present in which the lime content resulting from the presence of the dolomite averages from 7 to 10 per cent.

A summary of the reserves of magnesite and magnesite dolomite in sight on the various properties in Canada is as follows:*

	Magnesite containing less than 12% CaO. (Tons)	Magnesite dolomite containing more than 12% CaO. (Tons)
Lot 13, range I, Harrington Tp. ..	25,000	8,000
Lot 18, range XI, Grenville Tp.	15,000	6,000
Lot 15, range XI, Grenville Tp.	418,000	186,300
Lot 15, range X, Grenville Tp	2,500	4,000
Lot 15, range IX, Grenville Tp.	226,400	279,400
Total	686,900	483,700

Of the above total, however, there is approximately 69,000 tons of magnesite on lot 15, range IX, and 10,000 tons on lot 15, range XI, that could not be profitably mined unless a market for magnesite-dolomite was procured.

According to M. E. Wilson,† from whose report the above figures are taken, it is likely that extensive deposits of magnesite occur beneath the superficial covering of clay in the low-lying parts of the district.

Operations.

Work was begun on the Canadian deposits in a small way in 1907, at a place about 12 miles from the Canadian Pacific Railroad, the nearest station being Calumet. It was vigorously pushed during the war, but shortly after the close of the war, December, 1918, two of the companies —the Scottish-Canadian and the North American—stopped work, and the International Magnesite Company suspended operations in February, 1919. The different companies resumed operations during May and June of the present year.

Costs.

Though ore is hauled to the main line of the Canadian Pacific Railway over the narrow gauge track of the Scottish-Canadian Magnesite Company, some ore has been hauled in waggons, in the past, over the road to Calumet, and this practice will be resumed by the North American Magnesite Company as soon as its calcining plant at Calumet is completed.

The cost of transportation during the summer season, when haulage takes place over the regular country roads, is more expensive than during the winter, when sleds may be used and when more direct routes to the railroad can be taken. For a distance of ten to fifteen miles from the railroad, haulage costs during the summer are approximately $6 per ton, and during the winter, about one-half of this. The above figure, $6, includes only the cost of hauling, the loading at the quarries, and the expenses of upkeep of horses, and rolling stock.

Coal costs $6.15 per ton delivered at Magnesite siding. The price of labor is comparable with costs in the United

*It must be noted in this connection that these estimates have no definite relationship to the amount of magnesite present on the various properties since some deposits have been more extensively developed by diamond drilling.

†Magnesite Deposits of Grenville, District, Argenteuil County, Quebec, No. 81, Geological Series, Memoir 98, 1917, pages 62-63.

States, and ordinary labor receives 35c to 50c per hour. Most of the men receive $4 or more daily. Electric power should be very reasonable. The Scottish-Canadian Magnesite Company is planning its own installation of 2,000 horse power on the Rouge River, three to four miles away from its camp. This will furnish a cheap and abundant source of power.

OPERATIONS OF THE DIFFERENT COMPANIES

Scottish-Canadian Magnesite Co., Ltd.

The quarry and plant of the Scottish-Canadian Magnesite Company, Limited is located fourteen miles north of Grenville. Their material is hauled out on a narrow gauge railroad belonging to the Company—a line thirteen miles in length connecting with the Canadian Pacific Railroad at Magnesite siding, about three miles east of Grenville Station. This Company also hauls out, over the same road, some of the products of the other two companies working in the vicinity, namely, the North American and the International Magnesite Companies, but some of these companies' ore is hauled to the railroad in wagons.

The dead-burned magnesite produced by the Scottish-Canadian Company formerly was prepared at the plant of the Canadian Cement Company, at Hull, Quebec. This work began in October, 1917, one rotary kiln being used. The initial production was about 35 tons of grain magnesite per day, but the demand for the product grew to such an extent that three kilns were in operation during May, 1918, and the production amounted to 100 tons per day.

This Company has now given up its work at Hull, and is now installing a calcining plant at its quarry near Grenville. This installation will consist of three rotary kilns as at the Hull plant. The magnesite, as it comes from the ground, will be passed through a jaw crusher and ball mill, and ground finely enough to pass through a 100-mesh screen. It will be mixed with 6 per cent. of iron ore, which is found on the property of the Company; next, it will be fed to the rotary kilns, such as are ordinarily used in cement burning, and will be fired at a temperature of 2800° F. The fuel used will be powdered coal blown into the kiln under pressure. The kilns, of which there will be three in number, will be each approximately sixty feet long, and it will take about one hour for the material to travel through them.

The burned product is a hard, dense, granular, and dark brown material about the size of fine gravel, and it is expected that it will be sold as in the past for lining the bottom and sides of open-hearth furnaces. The installation at Grenville will cut the freight to Hull just about one-half, since about half the weight of the crude rock is driven off during the process of calcination.

Three open quarries or pits have been opened on the property of this Company, but these have filled with water since operations were suspended in 1918, and they could not be examined at the time of the writer's visit during September. None of the pits are very deep, not over 75 to 100 feet, and the longest is not more than 100 feet. From their position on the low ground between the hills, the water has to be pumped to keep them dry. In this respect, they differ from the deposits in Washington, which are confined to the hillsides or hilltops for the most part. The present operations, which are in the nature of preliminary work on the new installation, began about May 1, 1918.

International Magnesite Company.

The quarry and calcining plant of the International Magnesite Company are located 1½ to 2 miles north of the Scottish-Canadian Magnesite Company's plant. The product of the International Magnesite Company is being hauled to a spur of the former Company's narrow gauge road, and thence to the main line of the Canadian Pacific Railroad at Magnesite Siding. The International Magnesite Company is now operating in one rather shallow (30 feet deep) quarry. From a nearby quarry, now filled with water, considerable magnesite has been formerly removed. The quarried rock is hoisted on an incline to the top of a vertical kiln—about 50 feet tall and 10 feet in diameter. Wood is used as fuel. The calcined material is drawn every two hours. The capacity of the present plant is not more than 12 tons per day of calcines, which, in this case, is the caustic product used for chemical purposes, chiefly in the manufacture of Epsom salts. So far as known, none of the product from this plant goes into the manufacture of plastic flooring.

North American Magnesite Company.

The quarry of this Company is located about eight or nine miles north of Calumet. The raw rock is now being hauled to a siding on the narrow gauge railroad belonging to the Scottish-Canadian Magnesite Company, and over this Company's road to Magnesite Siding on the Canadian Pacific line. At present, only raw rock is being shipped, going to the calcining plant of the company at Montreal; no calcines are being produced in the kiln located at the quarry. Some hauling has been done in wagons to the main line of the Canadian Pacific Railroad.

The installation at the North American plant consists of one vertical kiln, about 50 to 60 feet high, and 10 to 12 feet in diameter like that at the International plant. The raw rock is fed from the quarry in an aerial bucket. Wood is used as the fuel, the fire being built in four arches, thus avoiding contaminating the product by the ashes. Firing is done in the floor above the dumping hopper. The capacity is 10 to 12 tons daily.

The Company is now excavating the foundation for a calcining plant with rotary kiln on the Canadian Pacific Railroad at Calumet. This plant, it is expected, will have a capacity of 70 tons calcine daily. It will be possible, by this arrangement, to do much or most of the hauling of the crude ore during the winter season, when snow is on the ground, and hauling is cheap, and to use the stored crude ore as it is needed. It is doubtful if the vertical kiln at the quarry will be again used, but will be supplanted by the modern plant now in course of erection.

This Company has two quarries on its property, located about 500 feet from each other. The quarry now being worked is about 250 to 300 feet long, from 100 to 150 feet wide at the widest part, and approximately 50 feet deep. It is evident that a very large tonnage of rock has been removed from it—the great bulk of which has been converted into calcines at Montreal.

WATER POWER IN NOVA SCOTIA.

The following horse-power is available in Nova Scotia for continuous loads; St. Croix River, three thousand horse-power; Gaspereaux, seven thousand; Nictaux, three thousand; Paradise, three thousand; Lequille, three thousand; Bear River, five thousand; Sisiboo, four thousand. Total, twenty-eight thousand, which for commercial purposes might be multiplied two and a half times, making seventy thousand horse-power for the usual load periods. These rivers all cross the Dominion Atlantic Railway, and extend from Halifax to Yarmouth, a distance of 217 miles. Halifax county is capable alone of producing an additional thirty thousand horse-power.

Canadian Mining Institute---Western Meeting

Western Members of the Institute Convene at Vancouver and Hold a Successful Three-Day Session

ON November 26th, 27th and 28th last, members of the Canadian Mining Institute who reside in Western Canada held a general meeting at Vancouver, B.C., which will be recorded as one of the most successful gatherings of mining men ever held in Canada, and which should surely result in the hope of the Executive of the Institute being realized, that this would be the first of a series of annual general meetings to be held in the West. The Council of the Institute had decided to hold the Vancouver meeting in view of the fact that Western members, except in rare instances, could neither spare the time nor the expense to attend the regular general meeting held each spring in the East. The sessions at Vancouver were indeed interesting, and proved highly profitable to all who attended. After being welcomed to the Terminal City by Mayor R. H. Gale, the delegates went into a general business session, which was followed in the afternoon by a session devoted almost entirely to coal mining, presided over by Mr. O. E. S. Whiteside, general manager of the International Coal & Coke Co., Coleman, Alta. The feature of this session was a paper by Mr. E. G. Wilson on "The Cassidy Coal Mine," the well-known mine located on Vancouver Island. The Cassidy Mine, as described by Mr. Wilson, was a model coal plant, where the best of relations existed between the operators and employees. The town site, planned by the company, is an ideal one, and the residence area comprises about eighty acres of fine beach land. A recreation hall, library, dance hall, gymnasium and billiard rooms, have been built at Cassidy, all of which go to make ideal conditions under which men can work.

In the evening Major R. W. Brock, Dean of the Science Department, University of British Columbia, addressed the delegates. Major Brock, who was on active service in Palestine during the war, took as his subject "Palestine," dealing particularly with its geology, and giving his audience some first-hand information concerning the campaign conducted there by the Allies. He exhibited a number of lantern slides showing the geological formation of Palestine, views which he had secured while making the geological survey of Palestine for the British Government during the war.

"Palestine has seen some queer armies," said Major Brock, "but surely never such a polyglot collection of races as Allenby's. Yet in a few months they were welded into a united and well-trained army, and the defeat of the enemy was accomplished in the face of appalling difficulties."

Thursday, November 27th, Session.

Major Angus Davis presided at the morning session of the 27th, which was devoted to metallurgy. "Possibilities for Platinum in Western Canada" was the subject of a paper delivered by Mr. Uglow, of the University of Vancouver. Mr. Uglow stated that a survey of platinum-bearing deposits in Western Canada gave indications of there being a good supply of the metal.

He declared that three lines of attack were needed to develop these possibilities. First, attention had to be directed to those localities where the geology was similar to that in producing districts; second, the ground should be accurately tested in accordance with approved methods; and third, progress had to be made in the matter of facilitating the recovery of platinum from lode ores and auriferous gravela.

It was pointed out that a platinum determination was a difficult one for an assayer to make with his regular equipment, and samples of material in which the presence of platinum is suspected should be sent to a reliable chemist who is accustomed to such work.

The "Hydrometallurgy of Copper Sulphides" was discussed in a paper by Mr. William E. Greenawalt, of Denver, Colo., and presented by Mr. G. F. Elridge, who reminded his audience that when Mr. Greenawalt's book on "Hydrometallurgy of Copper" had been published in 1912 there was not a single electrolytic copper extraction plant in successful operation. Since then many large copper leaching plants had come into successful operation, two of the largest copper plants in the world now using the electrolytic processes exclusively. These plants, he said, were operating on low-grade oxidized ores, and there did not appear to be a plant in operation treating concentrates or high-grade sulphide ores.

Mr. Greenawalt predicted a promising future for the small mine operator when he said in his paper:

"The small and independent miner, who can rely on steady supply of ore, may, no doubt in a few years, be shipping electrolytic copper instead of ore and concentrates. This conclusion seems to be inevitable."

The afternoon session was featured by an address by Mr. H. N. Freeman, Vancouver, on "New Methods of Hydrometallurgy of Gold and Silver." Mr. Charles Camsell, Vancouver, acted as chairman, and Mr. Freeman's address was followed with intense interest by the large audience. How German-made cyanide was replaced upon the Canadian and American market and forever displaced by the new product was explained by Mr. Freeman.

Mr. Freeman's address set forth that he had commenced carrying out his researches into methods for the extraction of gold and silver in Vancouver six years ago. His hope then was to produce a cheaper grade of cyanide in Canada for Canadian mines, to replace the more expensive German product. Before the war he made a special study of the German product, sodium cyanide, with a view to improving it. The outbreak of the war resulted in the discontinuance of German shipments, and a shortage early developed. A heavy demand for cyanide developed from South African mines, and the fact that no more could be secured from Germany gave Mr. Freeman an added incentive to increase his efforts to improve the process.

He was called upon by the American Cyanide Co. to rush his research work. This consequently was carried out in Vancouver in collaboration with the company. Mr. Freeman explained in detail the process of manufacturing the new form of cyanide.

Firstly, the calcium carbide is prepared by fusing coke and lime in an electric furnace. Secondly, pure nitrogen is procured from the atmosphere by the distillation of liquid air. The nitrogen is then brought into chemical combination with finely crushed calcium carbide, producing calcium cyanamid. This is then powdered and mixed with

ordinary salt, which supplies, in the cheapest form, the sodium necessary. The mixture next is brought to a molten state and is chilled quickly, to prevent return to its former components. The process of chilling is patented, and the operation which retains the cyanide takes only ten seconds.

The product can be produced at a considerably lower price than the German variety. The production of the plant, located at Niagara Falls, Canada, is now being disposed of in Mexico, New Ontario and the Western States. Mr. Freeman said the production for the six months ending this year would exceed 10,000,000 pounds. The experience in Cobalt, he said, was that purer silver was produced at a lower cost. Less of the cyanide was used.

The plant at Niagara Falls was built under Mr Freeman's supervision.

Another process which has been evolved by Mr. Freeman is a lead sodium alloy for the recovery of cyanide. Under the old process the cyanide was all lost, but with this process part of it may be recovered and used anew.

Mr. S. S. Fowler, of Nelson, in moving a vote of thanks to Mr. Freeman, said that the new process of producing cyanide was a radical advance in the metallurgical art. J. A. M. Dawson said Vancouver chemists thought a great deal of Mr. Freeman, taking great pride in the fact that he was a citizen of that city. Mr. Freeman had done work of great importance in discovering the new cyanide process when the mines were cut off from the original source of supply. Local chemists were taking a great deal of interest in the work Mr. Freeman was carrying on.

Resolutions.

A resolution was passed urging the Government to formulate a suitable plan for the proceeding of aid in prospecting to returned soldiers. Also a resolution, "That the formation of a Canadian Association of Engineers for the purpose of social service, mutual protection and legislation, is desirable and in the best interests of the public and of the profession."

Dealing with the taxation of mining machinery the members passed the following resolution:

"That the convention urge the desirability of suggesting to the Government that all machinery used in a basic industry, when imported by the user thereof for use in such industry, shall be allowed to be imported free of duty or war tax, unless such machinery is listed on a list to be compiled by a committee to be appointed by the Minister of Finance, such listing to be done only after reasonable publicity and examination held, at which all parties interested may be present and tender evidence; such listing shall only be made after it has been proven that such machinery is being made in Canada of the capacity stated and is of a quality equal to that hitherto imported, and is being offered for sale at a reasonable price."

SPECIFIC GRAVITY OF ETHYLENE GAS.

There have been great doubts as to the specific gravity of ethylene gas. The figures obtained by different experimenters have differed considerably from one another. M. T. Batuceas has determined it afresh, and found a new value 0.9749 times the specific gravity of air. This figure brings out the atomic weight of carbon as 11.996, 11.999, 12.005, or an average of 12.000.—*Gas World.*

THE PETROLEUM SITUATION IN UNITED STATES.

The Bureau of Mines of the United States has prepared a report on the present petroleum situation in the United States. The report, by Mr. J. O. Lewis, is as follows:

New development has been most active in the oil fields of the United States in central and northern Texas and northern Louisiana, and in the Elk Hills, California, the report states. The production of Texas has increased considerably, and the new field at Homer, Louisiana, is of considerable promise, many large wells being found there. Recent development in the Elk Hills, California, indicates the possibility of obtaining large supplies of light, refinable oil from that district if opened to development. The figures of the U. S. Geological Survey show a total production of 244,000,000 barrels of oil up to the end of August, 1919, as against 234,000,000 barrels of oil for the same period in 1918, an increase of 10,000,000 barrels to date, indicating a probable increase of 15,000,000 barrels, or 4 per cent. for the year. Stocks have increased 9,000,000 barrels, or 7 per cent., from January of the past year. Importations of crude from Mexico have greatly increased. The consumption for 1919 will be considerably above that for 1918. In general, the present situation in regard to supplies on hand of crude oil appears satisfactory.

Petroleum Products.

The gasoline situation continues satisfactory, and the current season has been passed without any acute situation as occurred in the fall of 1918. Gasoline production for August, 1919, was 326,000,000 gallons, as against 330,000,000 for 1918, and 254,000,000 for August, 1917. Stocks were respectively, 434,000,000; 285,000,000; and 298,000,000 gallons at the end of August for the years 1919, 1918 and 1917.

The production of kerosene in August, 1919, was 219,000,000 gallons, as against 148,000,000 gallons during August, 1918, and August, 1917. Stocks were 296,000,000 gallons in August, 1919; 424,000,000 gallons for the same month in 1918; and 511,000,000 gallons for the month of August, 1917. The decreased stocks in the face of increased production indicate the upward trend of the kerosene market. Kerosene has been in such demand during the last few months that the price has increased greatly and the stocks have been materially depleted, since the corresponding period of 1918. Stock have, however, built up from 244,000,000 gallons at the end of May to the present figure of 296,000,000 gallons at the end of August, indicating an easing of the situation.

There has been a considerable over-production of gas and fuel oil since the signing of the armistice reduced the wartime consumption of these products. Stocks have built up from 600,000,000 gallons in August, 1917, and 569,000,000 gallons in August, 1918, to 830,000,000 gallons at the end of August, 1919, but the increase during the last four months has been slight, as the stocks at the end of April of this year were 807,000,000 gallons.

The production of lubricating oils has remained practically constant during the past year, the production of August, 1919, being 72,000,000 gallons, which was the same for the year previous; production of August, 1917, was 64,000,000 gallons. Stocks, however, have increased from 115,000,000 gallons at the end of August, 1917, to 137,000,000 gallons for the corresponding month of 1918, and 170,000,000 gallons at the end of August of this year, indicating reduced consumption.

SUGGESTIONS FOR A TEXTILE LABORATORY.

In designing a laboratory for a textile plant one must be guided in the selection of equipment by the work that is required. This will vary to some extent, depending on the fibre to be considered and the actual work to be done on it. The extent of analysis and research are also determining factors. In general the work will fall into the classes enumerated below, and a good all-round laboratory will take them into account. In some plants certain kinds of laboratory work may predominate, while in others some of the other classes may be of greater importance. Any laboratory that is performing its proper functions will have some connection with them all. These divisions will cover almost any case that may arise.

1. Clerical or Office Work.

Handling technical correspondence. Keeping notes on works processes. Maintaining files of dyestuffs—i.e., type samples and samples from current deliveries with index system. Maintaining files of dyed and printed samples of type colors, special shades, etc. Maintaining files of dealers in chemical supplies, dyes and equipment. Files of all analytic results and separate file of all methods of analysis and tests in current use. Files to record all experimental results not otherwise covered. Color matching.

2. Chemical Work.

Routine inspection or analysis of deliveries of supplies, including dye tests. Tests of all new materials or new brands offered. Research—working out new ideas on mill procedure or materials. Analytical investigations of works troubles.

3. Work of Rougher Nature.

Semi-practical mixing, boiling, dyeing, printing, etc. Washing dishes and other apparatus.

For the proper carrying out of these various functions a laboratory of three rooms will be found most satisfactory. Each class of work will then be carried on in a separate room, although it will be found impossible to make any hard and fast separation. The relative sizes of the three departments will have to be determined as a separate problem for each individual case. Two of the rooms will be passed over with only a brief mention, because their equipment will be of the same order as that of any office and laboratory. The details of filing cases, shelves, benches, apparatus and chemical supplies, and their arrangement will have to be worked out according to the space available and the work that is to be done. It is often best to put in just enough to get a good start and then develop the outfit as the need for additions arises. The third room is not usually provided as outlined here, but since this idea has been found very useful in certain cases it will be described at greater length than the others.

The first room will serve as an office. It should have good natural light for color matching, most of which will be conveniently done within easy reach of the files of dyed samples. The microscope and analytical balance may be kept in this room, but very little, if any, experimental work should be done here beyond the use of these instruments.

The second room we will call the analytical laboratory. Here will be conducted all the analyses of supplies, as well as ordinary dye tests including identification of dyes and finishing materials on the fibre. Moreover, all research and other chemical work involving the use of the usual laboratory appliances will be carried on in this room, the idea being to limit it to the cleaner types of manipulation. It should be provided with a hood to take care of all steam and fumes that naturally arise.

Room for Semi-Practical Work.

The third room is for rough, semi-practical tests of various sorts, especially for operations that are sloppy, or give off excessive amounts of steam. A ventilating fan should be provided, and in most cases this can be arranged so as to furnish draft for the hood in the analytical laboratory at the same time.

The floor should be of concrete or other waterproof construction, sloping toward a drain, so that it can be washed down with plenty of water. This will often be found exceedingly useful. For example, the writer once saw a whole barrel of aniline black pigment that was being mixed in an experimental way froth up violently and practically empty itself on the floor when an assistant added some of the ingredients too rapidly. The ensuing mess can easily be imagined. It was not difficult to clean up, however, with a sloping floor and convenient drain.

It is a good plan to have these three rooms arranged in a row in the order in which they have been mentioned so that the place where most steam is developed will not be in close communication with the office. The third room should have a door through which heavy materials can be carried in or out without taking them through the office or analytical laboratory. Here will be found also a convenient place to unpack consignments of glassware and other supplies. Among other uses may be mentioned dish-washing. A neat way to handle this will be to pack all apparatus as fast as it becomes soiled on to a light truck like a tea-wagon, then wheel it out to be washed.

This third room can be used for all operations that would be considered out of place in an analytical laboratory. This includes all such manipulation as dye tests that give off considerable steam, making experimental mixes on a fairly large scale, as of pigments and softeners, and other work such as the recovery of utilization of by-products. Miniature dye kettles of other types of machinery can be set up and pails, tubs, and even barrels brought in if required. It will be usually found that facilities are lacking in the works for practical experiments. Then the necessary material can be made up in the laboratory where thermometers, specific gravity glasses, and other testing instruments are convenient. Everything can be done under carefully controlled conditions, and when ready the mix will be taken out into the works and run on the regular machinery.

The writer has often seen experiments spoiled or the results rendered uncertain by trying to boil or dye small batches in large kettles, or to carry out some other operation where the elements entering in were out of proportion. Many of these difficulties can be overcome by working in conjunction with laboratory tests made on a semi-practical scale.

In such a room, too, would be installed a convenient dry-pipe for samples of cloth and a dryer for raw stock, as used in the dyehouse in matching off. An open steam pipe should be available, not only for heating up water and solutions, but for dyeing as well. Instead of heating over a lamp, where the dye liquor is steadily diminishing, the open pipe furnishes a process where it is steadily increasing just as in the dyehouse. Sometimes, of course, there is a tendency to increase much too rapidly from condensation in the pipe. This, however, can be controlled if it

is sufficiently important. Here obviously a little boiling over on to the floor will do no damage.

Large Sink Useful.

In case it is not possible to have an extra room for rough work, and it is not permissible to spill too much water and other liquids on the floor, a large built-in sink will be found very handy if set somewhere far enough from the walls of the room to be accessible from all sides. The writer has such a contrivance in successful operation. It consists of a flat, lead-lined sink, four by seven feet, with straight sides about four inches high. The nearer it can be set to the floor, consistent with proper drainage, the better, because heavy barrels or tubs are more easily handled if it is low. A little larger size will be more convenient for most purposes.

In one end set the dye bath on a table so that the operator can stir it from the floor, but far enough from the edge, so that anything boiling over will be caught in the sink. The wringer also will be over the sink. The outfit will be served by a water pipe, and by any number of open steam pipes or closed coils as may be required for the work in hand. A leaky valve will not then make a flood on the floor, and at the same time a convenient place is furnished to empty large volumes of water or solutions without interfering with the regular laboratory sink.

These suggestions all have the advantage of having been tried and found useful in certain works laboratories. They have been presented in this general way with the idea that they will be of interest in connection with starting new laboratories and will help put the work on an orderly basis.—*Textile World Journal.*

UNITED STATES POTASH PRODUCTION.

In 1913 the United States imported 270,720 short tons (2,000 lb.) of actual potash content (K_2O) of potash salts. Of this total over 99 per cent. came from Germany, and there was no potash industry in the United States. Since then the imports have declined almost to a vanishing point, and during 1918 there were seventy-eight firms engaged upon the production of potash compounds. Their output was 192,587 short tons of crude material, containing 52,135 short tons of K_2O.

Production in 1918.

The following returns show the various sources whence potash was derived during 1918:

Source.	Number of producers.	Total production.	Available potash (K_2O).
Natural brines	21	147,125	39,255
Alunite	4	6,073	2,619
Dust from cement mills	9	11,739	1,429
Kelp	6	14,456	4,292
Molasses distillery waste	4	9,505	3,322
Steffens waste water	5	2,818	761
Wood ashes	26	609	365
Other sources	3	262	92
	78	192,587	52,135

Potash produced classified according to product marketed.

Product Marketed.	Total production.	Variation in content of K_2O.	Average content of K_2O.	Available (K_2O).
Muriate	30,127	38.0-58.5	41.8	12,614
Low-grade chloride	6,559	10.0-20.0	13.6	894
Sulphate	6,672	25.0-51.0	47.9	3,188
Crude sulphate and carbonate	122,741	18.0-38.0	25.5	31,311
Crude carbonate and caustic	609	50.0-78.0	60.0	365
Potash char, ash, and ground kelp	14,630	12.0-42.5	19.8	2,896
Cement and blast furnace dust alum, raw and calcined alunite	11,249	2.5-13.0	7.7	867
	192,587	—	—	52,135

A SHORT SURVEY OF COBALT PRODUCTION.

Cobalt minerals are rather uncommon except in the Cobalt district, Ontario, where they occur in ores that are worked for their silver content, the cobalt produced being a by-product. As these ores are brought to various smelters, according to changes in smelting contracts, the material comes on the market from different places at different times. In the main it is marketed as cobalt oxide, the metal is produced from the oxide by reduction. The principal use of the metal is in the patented alloy known as stellite (about 80 per cent. cobalt) which is used as a high-speed cutting tool in place of steel. It is also used in high-speed tool steel which contains 4 per cent. cobalt and 16 per cent. tungsten. It is also claimed that it can be used as a substitute for nickel in plating, the rate of deposition being faster it is claimed, than with nickel and a thinner coating giving equal protection. Other uses of cobalt compound are the making of insect poisons and also for coloring pottery and glass, to which it imports the shade known as Delft blue, and also certain purple shades.

Official statistics give the output in Canada in 1916 as 841,859 lbs., of which 215,215 lbs. was in the form of metal. The oxide produced amounted to 670,760 lbs., and there were smaller quantities of sulphate, carbonate, and hydroxide of cobalt. Up to the present time the supply of cobalt available from the Canadian ores has been abunbant to meet all demands.

There are only two sources of cobalt in the United States that are of any importance. A deposit at Blackbird, Idaho, is owned by the Haynes Stellite Co., which has erected a plant for the production of cobalt concentrates. Cobalt, nickel, and copper sulphides occur in association with lead ores at Fredericktown, Mo., and some cobalt oxide is now being produced by the Missouri Cobalt Co. The price of cobalt metal has averaged about $2.00 per lb. in the United States.—Part of Report on Cobalt, by the U. S. Bureau of Mines.

NITROCELLULOSE FROM WOOD PULP.

The United States Forest Products Laboratory have recently conducted experiments on the using of wood pulps in the production of cannon powder and have succeeded in producing by all three pulping processes (the soda, sulphate and sulphite) pulps which meet all surveillance tests for use in nitrocellulose manufacture. These pulps have been nitrated at the Picatingy Arsenal and run into powder of several calibus. For many years certain sporting powders have been derived in part from wood pulp, but only lately has there been any research looking toward the use of wood pulp in the production of cannon powder.

At certain steps in the process of manufacturing nitrocellulose, wood pulp can not be handled as easily as cotton, but at other points it yields to treatment more readily. On the whole, the differences in manufacturing is said to be in favor of wood pulp. The yields are a little less than those obtained from cotton, but the material satisfactorily meets all laboratory tests for cannon powder.

CONCRETE CHIMNEY 500 FEET HIGH.

A big reinforced concrete chimney in Japan, 550 feet high and tapering from 42 feet eight inches to 27 feet 5 inches, is the second tallest in the world. Measurements have shown that a wind of twelve miles an hour vibrates the top less than one-twenty-fifth of an inch. A wind of 54 miles increases the vibration about an inch, and with hurricane force it reached 7.7 inches, the oscilation lasting about 2.51 seconds.

Chemical Society News

OTTAWA BRANCH, SOCIETY OF CHEMICAL INDUSTRY

The inaugural meeting for the season of 1919-20 of the Ottawa Branch of the Society of Chemical Iudustry was held at the Chateau Laurier, Ottawa, on the evening of December 17th, and was a pronounced success. The Chairman of the Branch, Dr. Frank T. Shutt, presided, and there was a large number of members present to hear the speaker of the evening, Hon. George E. Foster, Minister of Trade and Commerce.

Sir George spoke of the great aid chemists had been to agriculture and industry. He pointed out that for centuries agriculture had had no scientific knowledge to guide it, merely the observations of the senses. Everything had improved during the last half-century, until now the modern farmer, or the intelligent one, was on the high road to success through the help of the scientific knowledge afforded him by chemists. Farming now owed the greater part of its success to this new released force brought to them by the chemists. As in agriculture, so in industry, chemistry had revolutionized industrial methods. Amazing had been the development in power and processes.

Dr. A. McGill expressed the thanks of the members to Sir George.

Dr. Shutt's Address.

Prior to Sir George Foster's address, Dr. Shutt, Chairman, addressed the meeting, and referred particularly to the classification of chemists in the civil service. We quote in full from Dr. Shutts' able and timely address:

"My task to-night as your Chairman is, I am glad to say, an easy one, inasmuch as I am relieved of the necessity of delivering a presidential address. It is also a pleasant one, since we have as our honored guest the Right Honorable Sir George Foster, Minister of Trade and Commerce, who, notwithstanding his many activities and the many calls upon his time, kindly consented to be with us to-night and to address us on matters that vitally concern us as chemists; matters relating to the application of chemistry to the industries and commerce of the Dominion; matters of advice and counsel as affecting our professional life, and possibly a word or two of encouragement—which I can assure Sir George we much stand in need of—in pointing out the important role that chemists must play in the future development of our country's resources. We are to be congratulated on having Sir George at this, our inaugural meeting, and I can assure him we shall listen to his address with great interest.

"It is not my intention, as I said, to make any formal address, but there are one or two matters pertaining to our Society and its work upon which I wish to speak briefly.

"First of all, I wish to take this opportunity of thanking you heartily for the honor you have done me in electing me, the second time in succession, as your Chairman. It is very gratifying to have this expression of your confidence. I thoroughly appreciate the honor, and I think I fully realize the responsibility which its acceptance entails. I can assure you that I shall do all in my power to make our meetings this season a success. In this latter matter, however, I must not take to myself too much credit, for we have an excellent working committee and an exceptionally able and enthusiastic secretary, who is indefatigable, and to whom both you and I owe much—very much—for his efforts—successful efforts—in the building up of our programme and increasing our membership.

"And now, a word or two about our Society and its welfare.

"It was on a similar occasion to this last year that we set sail on our maiden voyage. At the end of the season, after a pleasant and successful passage, we made harbor safely. To drop the metaphor, our programmes were interesting, our discussions profitable and our attendance good. Several of the papers presented were of unusual interest, and most were certainly worthy of permanent record. There was one feature of the programme respecting which I must make a confession. I felt quite doubtful as to the advisability of introducing the moving picture element. It seemed to me a little undignified for a scientific society. However, I'm converted. The films which were kindly loaned to us, and others which I have seen of our industries and manufactures, convinced me that for illustrating certain phases and aspects of manufacturing processes the moving picture could be very advantageously used—indeed, had no superior. I am pleased to say our programme this season will include two or three exceedingly interesting films.

"Speaking of programmes, we had hoped to have this season's programme in your hands three or four weeks ago. After a number of disappointments, which had to be met by the resourcefulness of the Secretary, it is now ready, and will be presented for your acceptance this evening. I am sure that it will be found no less interesting than that of last season.

"As to our membership. For a small society, we have lost rather heavily, due chiefly to resignations from the Government chemical service during the past three or four months. This is doubly regrettable, for the service can ill afford to lose its promising men. We must make good this loss—and more. How many chemists in the Government service or otherwise engaged in the city who are not on our membership roll I cannot say, but we are going to make an effort, in which I would enlist the interest of every one of you, to lay before them the claims of the society. There should be no difficulty in convincing them it is to their duty and in their best interest to join us.

"There is a further matter in this question of membership to which I would refer. All those interested, directly or indirectly, in the chemistry of manufactures and industries, are eligible for membership and may find a legitimate place among us, to their interest and profit. We hope to very considerably enrich our membership this season from the ranks of Ottawa manufacturers. We hope to make the society a practical and useful link between the professional chemist and those who may benefit in their work from the application of chemistry to the advantage of both.

"This is neither the time nor the occasion to enter upon a discussion of the new Civil Service Act and the re-classification as it affects the chemists, but I must not on this important occasion pass the matter over entirely in silence. After many months of weary and anxious waiting, we were dismayed beyond measure as we turned the pages of the blue book of the new classification. Our expectations were dashed to the ground. Perhaps, considering the personnel, or, rather, the training of the body which made the classification—or, to speak more correctly, the compilation—we could not have expected much else than we got. It was just as impossible for those 'experts' to rationally classify the chemical service as it was for them to make a Greek lexicon. In a word, they had not the requisite knowledge.

"It is obvious that an alphabetical arrangement of all the positions in the Government service could be no true

and satisfactory classification. I don't wish to enlarge on this phase of the matter, but the more one looked into it the more one was impressed, as far as the chemical service was concerned, that the classification, so-called, was a chaotic muddle, full of inconsistencies, anomalies, and altogether inadequate to meet the requirements of the service.

As it very soon became evident that a revise of the whole classification would be called for, we convened a special meeting of the Society to discuss the matter and appoint a committee which would draw up and submit to the Government a rational classification based on a knowledge of the training of chemists, their qualifications, the character of the work expected of them—a classification sufficiently elastic and sufficiently comprehensive to permit of the placing and grading of every chemist in the service and ample provision for all possible positions in the future. Your committee is well deserving of thanks and praise for the way in which they discharged their duties. They did a large amount of hard work, and as a result evolved a classification for the chemical service that, if adopted by the Government would, we feel assured, prove acceptable and satisfactory to all concerned and tend to improve the service by attracting to it the best men in the field.

"This schedule, endorsed by the whole Canadian Section of this Society, was presented to the Government and the Civil Service Commission, with an urgent solicitation for its adoption. We followed up the matter by appearing personally before the Commission and presenting the claims of the chemists. We were well received, and if it had not been that the adoption of our classification would have, incidentally, entailed the reconstruction of the whole scheme—the alphabetical scheme—I believe it would have been accepted. As it is, we were successful in very materially improving the various classes of chemists in the matter of salary range. But there is much more to be done, and it is we who will have to do it. During the last few months the Government chemical service has lost, to my knowledge, eight to ten of its most promising younger chemists. If this continues it will be a mediocre service in five years—it is inevitable. So in our country's interests, as well as our own, we must continue, on every occasion that presents itself to publicly put forward the value of the chemist's work to the community at large and to urge his claims to a more adequate compensation for his services.

"You will doubtless remember that my presidential address last year dealt chiefly with a proposed organization of Canadian chemists—a Dominion-wide, national society. We saw that such a society, with high standards of admission to its fellowship, would be a very important factor towards raising the professional status of the Canadian chemist and giving him his rightful place in the eyes of the community with members of the medical, legal and engineering professions. We thought that whatever chemistry and chemists could do towards increasing the wealth and promoting the welfare of the people of this Dominion could be done more effectively and economically if the chemists had such an organization.

"We considered that such a society, of this standing and high ideals, would act as a stimulus to more thorough, profound and careful work by Canadian chemists.

"But I need enlarge no further on the advantages of such a society. What was then a project is now an established fact. The Canadian Institute of Chemistry is an organized society, with permanent headquarters in Montreal. A large number of the leading chemists in Canada have applied for fellowship. My view is that every chemist having the necessary qualifications and intending to do his life's work in chemistry ought to join the Institute. And this is my advice to you. The Institute can only successfully accomplish its objects if it truly represents the professional chemists of Canada. The work of the Institute, let me remind you, will in no way interfere with the work of the Society of Chemical Industry. The former may be regarded as a strictly professional society, the chief object of which is to safeguard the interests of chemists and raise the status of the profession throughout the Dominion; the latter is a practical working society, the chief function of which is to bring chemists together for the dissemination and interchange of chemical knowledge."

The Season's Programme.

The Ottawa Branch have arranged a splendid programme for the season. At the January meeting Mr. Lindon W. Bates, Esq., Secretary of the Submarine Defence Association, New York, and inventor of colloidal fuel, will give an address on "Colloidal Fuel." On February 5th Mr. Edgar Stansfield will give a descriptive talk on "A Modern By-product Coke Plant," and motion pictures of the Koppers Company, Pittsburg, Pa., will be shown. At the same meeting Mr. F. J. Kennedy, Montreal, will give a short address, with lantern illustrations, on "Modern Methods in Gas Manufacture." At a second meeting in February (date not set) Mr. A. E. MacRae, of the Patent Office, Ottawa, will give an address on "Patent Legislation from the Chemists' Viewpoint."

On March 4th a motion picture showing the manufacture of zinc oxide, views loaned to the Branch by the New Jersey Zinc Co., will be given. Lieut.-Col. J. A. Amyot, Deputy-Minister, Department of Health, Ottawa, will address the second March meeting on "Some Public Health Problems," while in April the annual business meeting of the Branch will be held.

The officers of the Ottawa Branch for 1919-1920 are: Chairman, Frank T. Shutt, M.A., D.Sc.; Secretary, S. J. Cook, B.A., A.I.C. Committee: M. F. Connor, B.Sc.; O. J. D. Thomas, A. E. MacRae, B.Sc.; Fred J. Hambly, F.I.C., and Edgar Stansfield, M.Sc.

Toronto Branch, Society of Chemical Industry.

The second meeting for this season of the Toronto Branch of the Society of Chemical Industry, held at the Engineers' Club Thursday evening, December 11th, 1919, proved very successful. The meeting was well attended and everyone enjoyed the evening, especially the address delivered by Brig.-General C. H. Mitchell, C.B., C.M.G., D.S.O., C.E., LL.D., Dean of the Faculty of Applied Science and Engineering, University of Toronto. The usual dinner preceded the business of the evening. Under the head of "General Business," Mr. Victor Van der Linde reported for the Rubber Group of the Toronto Branch that that group had an interesting programme outlined for the season and that they were thoroughly organized and hoped to be able to accomplish something really worth while. Professor E. G. R. Ardagh, Chairman of the Toronto Branch, informed the meeting that the Paint and Varnish Group of the Toronto Branch were engaged on an active programme, and had also formed a club of plant superintendents within the group, which would work in conjunction with the Society of Chemical Industry.

The feature of the evening was the address by Brig.-General Mitchell, who spoke on "The War and Reconstruction as Applied to Chemical Industry." General Mitchell's address was closely followed by all present, and was more or less informal in style and replete with vivid descriptions and incidents, particularly relating to gas

attacks on the western front. The war, stated the General, was a "chemical war." The Germans right from the start had made the maximum use of their chemists in every branch of their army. The gas offensive, commenced by the Germans and first operated along the sector where the Canadians were established, led to defensive measures being taken by the Allied forces. The gas cylinders later gave way to the use of gas shells, which proved more effective and much easier handled. The use of the "mustard gas" by the Germans, and first experienced by the Allies at the Battle of the Somme, was referred to by General Mitchell as particularly villaineous, as it would attack any part of the flesh exposed. Many conjectures as to just what the enemy would "spring on" the Allies in the form of a new and more terrible gas were often entertained by the staffs of the Allied intelligence service. One was, stated the General, that the Germans were preparing a gas with frightful effects of some such nature as prussic acid, but the chemists in the Allied service, after experiments, allayed such fears by giving assurances that such a gas would never be used, as it was too volatile. Dean Mitchell closed his remarks with a few words on "trade" and "power." As to trade, the Allies had succeeded in wrestling away from Germany practically all trade during the war, and there was no reason why Great Britain, Canada and the United States couldn't continue to hold that trade, provided that science was allowed full sway and that chemical engineers and other scientific men were linked up with our industries. He had no fears as to the future of the extremely large class in chemistry now in the freshmen year at Toronto University, where over ninety students were registered in the first year. Canadian industries and natural resources to be properly developed would need these men.

Referring to power, the Dean said that he had been afforded a particularly good opportunity of observing the great water power developments of Italy while in that country following the signing of the armistice. Three-quarters of Italy's munitions had been made by hydro-electric water power plants, and while on this subject he took time to refer to Italy's fighting forces. "Great credit must be given to the Italian forces," stated the General; and he recited some incidents connected with the splendid fight that the Italian army put up against almost overwhelming odds and most adverse circumstances. In conclusion, he urged the chemists to make sure of their opportunities; not to be afraid to reach out and secure things. "It is yours; go and take whatever you want," was his parting optimistic message.

Following General Mitchell's address, the meeting was, as usual, thrown open for general discussion, and a very interesting half-hour or so followed, during which Professor Gill, recently appointed Chief Commissioner of Technical Education for Canada, lately returned from overseas service, and Mr. C. Price-Green, Commissioner, Industrial and Resources Department of the Canadian National Railways, spoke a few words. Dr. Gill pointed out that the Federal Government had set aside by vote of Parliament the sum of ten million dollars to cover a period of ten years for the development of technical education in the Dominion for the benefit of the sons of workingmen, following a grant of a similar amount a few years ago for the development of agricultural education, so that both labor man and farmer would have a fair chance. Having been only appointed to his new commission a matter of a week, he would not, he humorously remarked, go into the subject very deeply at present. Mr. Price-Green urged that more attention be paid to the immediate development of our natural resources. He had been greatly influenced, and had received a high appreciation of the value of chemical industries, by the National Exposition of Chemical Industries, held in Chicago in September, which he had attended.

Dr. Lash Miller, of Toronto University, expressed regret at the fact that Canadians and Americans did not take up the manufacture of certain lines of special chemicals such as Germany made and formerly sold in this country. For the convenience of trade, he thought British firms should establish agencies in Canada, for example, in such lines as filter paper. At present there was great inconvenience and considerable cost in trying to purchase certain chemicals and laboratory necessities from British concerns, and such lack of initiative on the part of British and American firms was driving one to purchase again from Germany.

Mr. Mason spoke in favor of greater and immediate development of Canada's mineral resources. Canada should stand on her own feet, he declared, instead of importing tons of raw material which she already possessed, but lacked development of.

After a few remarks from Dr. Hodgson Ellis, the venerable ex-Dean of the Faculty of Applied Science at Toronto University, the meeting adjourned.

PAINT AND VARNISH SUPERINTENDENTS ORGANIZE

At the first meeting of the year the Paint and Varnish Section of the Toronto Branch of the Society of Chemical Industry was permanently organized as the Toronto Club of Paint and Varnish Superintendents. A constitution was drafted, in which the objects and aims of the club were outlined. The qualifications for membership will allow superintendents, their associates and others interested in the problems of paint and varnish-making to gather together.

The opinion was expressed by those present that many live topics for discussion could readily be found, and it is anticipated that, by bringing men of rank before the club, the members and the industries they represent may be greatly benefited. Modern practice in paint and varnish manufacture is demanding more chemical control and investigation, and Canadian companies must endeavor to keep abreast of the times as far as current practice is concerned.

The following officers were elected for the year: President, G. C. McEwen, Imperial Varnish & Color Co.; Vice-President, H. M. Chamberlain, Lowe Bros., Ltd.; Secretary-Treasurer, W. H. Holt, of Glidden Varnish Co., Ltd.

CRUDE OIL IN NORTHERN MANITOBA.

It has been reported in the daily press that samples of crude oil have been brought to Winnipeg from a source near The Pas, Northern Manitoba. On investigations it appears that a certain amount of crude oil has been obtained in springs near Turnberry on the Canadian National Railway between Hudson Bay Junction and The Pas. Several sections of land have been staked out for purposes of oil investigation, and it is understood that some drilling will be done on the most favorable location near the oil indications in order to determine whether pools of oil exist in the underlying limestone.

BARITE DEPOSITS IN NORTHERN ONTARIO.

Veins containing barite occur in several parts of the Matachewan gold area, Northern Ontario. These are generally small, but two deposits have been found which would be of commercial value were they nearer railway transportation. The two deposits are located in Cairo and Yarrow townships respectively. The Cairo township deposit is situated on the west shore of Browning Lake. It can be observed about 100 feet from the shore of the lake, where a shallow shaft has been sunk. According to a survey and report made for the Ontario Bureau of Mines by Mr. A. G. Burrows, the vein here has a width of 15 feet, and the barite can be traced westerly for 100 feet, decreasing to a width of seven feet. Beyond this there is a drift, followed by an exposure of barite about 30 feet in length, from two to three feet wide. The barite is, for the most part, quite white in color and of good quality. A sample across eight feet on analysis contains 90.50 per cent. barium sulphate (barytes).

The deposit in Yarrow township was discovered in the bed of the creek which flows from Yarrow Lake to Mistinigon Lake, and attempts have been made to open it up by diverting the water by means of a small dam. Two shallow pits were sunk in the bed of the creek on the barite, which is in two veins, five and six feet wide respectively, separated by a band of quartzite. Mr. Burrows states in his report that as the deposit was noted only in the creek bottom its length has not been determined, but owing to its width it is probable that it also has considerable length.

Neither of these deposits are new, and will probably be of commercial value at a future time when railway facilities are closer at hand.

U. S. GOVERNMENT DISPOSES OF TNT.

The United States, through its Bureau of Mines, has disposed of the 29,000,000 pounds of TNT which were left as a surplus after the signing of the armistice. At first the Government feared that the surplus was so large that a large portion of it should be dumped into the ocean, but the Mines Bureau suggested that it could be used in road-building and reclamation work. Nine million pounds were used by the Bureau of Public Roads; two million pounds by the Forest Service; and the remainder by the Reclamation Service, the National Park Service and the Indian Office. While under ordinary conditions, states "*Chemical and Metallurgical Engineering*," it is regarded as improbable that TNT could compete commercially with dynamite, a great saving to the people has been made by the use of this surplus explosive. In road work contractors have allowed from 20 to 25 cents per cubic yard of the material to be removed by blasting. While that amount does not represent the full value of the explosive, it is considerably in excess of the 12½ cents per pound offer made for a portion of the surplus. That all of the 29,000,000-pound surplus should be allotted within eleven months after the armistice was a surprise even to the Bureau of Mines officials.

Correction.

Through an error in our information, Lieut.-Colonel J. T. Janson, recently returned from overseas to the Laboratory of the Experimental Farm, Ottawa, was given the rank of captain in our reference in the December issue to his return. Lieut.-Colonel Janson held the rank of captain when he went to France in 1915.

UTILIZING SASKATCHEWAN LIGNITE.

A report recently issued by the Lignite Utilization Board states that carbonized briquettes can be produced at the plant established at Estevan for $7 per ton. The pre-war price for anthracite in Manitoba and Saskatchewan was $15 per ton. Dr. A. B. McCallum, Adminstrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research, has recently visited Estevan and made further investigations into the lignite utilization scheme.

PERSONALS.

Mr. E. A. Smith, M.A. (McMaster Univ.), and pupil of the late Professor J. B. Tingle, who for the past three years has been engaged in soil analysis work for the Reclamation Service of the Department of the Interior, under the direction of the Dominion Chemist (Dr. Shutt) in the laboratories of the Experimental Farm, has resigned to accept a position in the research laboratories of the Standard Chemical Co., Montreal. While we are sorry to chronicle the loss of another good man from the Government service, we are pleased to note that Canadian industries are opening up many new opportunities for the chemist.

Mr. H. S. Hammond has resigned his position as Lecturer in Chemistry at Macdonald College to accept a place as Chemist with the Peerless Cereal Co., Woodstock, Ont. Mr. Hammond was also nominated as Professor of Chemistry in the Manitoba Agricultural College, but decided to accept the commercial position in preference.

Prof. J. B. McCarthy, of King's College, Windsor, N.S., has been appointed Assistant Professor of Chemistry at Macdonald College.

Mr. Schuyler L. Parsons, son of the late senior member of Parsons & Petit, 63 Beaver street, New York, has been admitted into membership in that firm.

BRITISH INDUSTRIES FAIR.

Admission to the British Industries Fair, to be held at London, Birmingham and Glasgow in February next, is by invitation only. Canadian buyers who propose to visit the Fair can obtain invitations from the British Trade Commissioners in Canada at Montreal, Toronto and Winnipeg respectively.

SOCIETY CALENDAR.

Canadian Institute of Chemistry. Second annual meeting. Toronto, May, 1920. Secretary, Harold J. Roast, 314 Beaver Hall Hill, Montreal.

Society of Chemical Industry, Canadian Section. Annual meeting, Toronto, May, 1920.

American Waterworks Association. Fortieth Annual Convention. Montreal, Windsor Hotel, week of June 21, 1920. Secretary, J. M. Riven, 153 W. 71st Street, New York.

American Chemical Society. General Spring meeting. St. Louis, Missouri, April 15 and 16, 1920. Secretary, Chas. L. Parsons, 1909 G Street N.W., Washington, D.C.

American Electrochemical Society. Spring meeting, Boston, Mass., April 8, 9, 10, 1920. On April 9 the meeting will be a joint one with the American Institute of Electrical Engineers, when "Electrically Produced Alloys" and "Power for Electrochemical Industries" will be discussed. A symposium on "Colloids" will be held on April 8. Secretary, Jos. W. Richards, Lehigh University, Bethlehem, Pennsylvania.

INDUSTRIAL SECTION

Construction, Manufacturing and Market News

British Columbia.

Alice Arm.—A 3,000-ton ore bunker is being erected at the wharf here to facilitate shipping. The Dolly Vardon Mine has been shipping over 3,000 tons of silver ore per month. The ore is of very high grade, one vein, known as "Glory Hole," being 39 feet wide, and from which the ore is packed in sacks, as there is too great an amount of native silver in it to ship openly. A large portion of this ore is said to average over $500 per sack of 100 pounds. It is believed that next spring will see a large number of prospectors at work in this district.

Mill Creek.—Plant extensions to cost $25,000 are being made to the Whalen Pulp & Paper Co.

Port Moody.—The Hyatt Steel Products Co. have resumed full operations at their plant here.

Prince Rupert.—The Prince Rupert Supply Co, it is understood, have made an offer for the creosoting plant at Victoria, owned by the municipality, which has been out of use for some time. It is presumed that the plant, if purchased, will be moved to Prince Rupert.

Negotiations are under way between the municipality, the G.T.P. and the American Canning Co. for the building of a big cannery at Prince Rupert.

Port Haney.—Gillan & Edgett, Vancouver, will erect a fruit cannery on the site of their present warehouse.

Sapperton.—The new utility building of the Swift Canadian Co. is nearing completion, and includes a new cooler building, improvements to the abattoir, and numerous other equipment to the plant.

Trail.—The new concentrator plant to be erected either here or at Rossland by the Consolidated Mining & Smelting Co. will be the largest in Western Canada, covering about one acre. It will be erected at Rossland if that municipality can supply enough water and take care of the tailings.

Vancouver.—That the erection of a steel plant on the British Columbia coast, financed by English capital, was a possibility of the near future was the declaration made by Mr. S. J. Crowe, M.P., at a recent meeting of the British Columbia Manufacturers' Association.

The Vancouver Engineering Works are making alterations and additions to their smelting plant at 519 Sixth Avenue.

A new branch of the Imperial Oil Co. is to be opened at Ladner, for which a site is now being secured.

The Barrett Co., Ltd., manufacturers of roofing and tar products, is one of the new factories located on the industrial site on the north arm of the Fraser River.

Machinery is now being installed in the new factory of the L'Air Liquide Societe, at the corner of Fifth Avenue and Yukon Street.

The Maple Leaf Iron Works, Ltd., have opened up a new machine shop at 25 Alexander Street. Boilers will be manufactured and marine work will be engaged in.

The Canadian Northwest Steel Co. have been granted a permit for the erection of a crane runway to cost $6,500.

Returns from the Tacoma Smelter on the second shipment of concentrates sent out from the Drum-Lummon Copper Co., Ltd., are among the highest received for copper ore shipped from British Columbia. They assayed: Gold, 0.68 oz.; silver, 27.66 oz.; copper, 62.88 per cent. The gross value was $275.50 per ton.

Nanaimo.—The Nanoose-Wellington Co., at Grant's Mine, are installing new boilers and a new breakwater, at a cost of $125,000.

Manitoba.

St. Boniface.—Marshall-Wells Co., Winnipeg, have erected a paint factory here, the building being 80 x 80 feet, four storeys high, reinforced concrete; cost, approximate $90,000.

New Brunswick.

Brockville.—The Provincial Lime Co., whose plant was destroyed by fire recently, have completed the greater part of the reconstruction of their works. The new plant will have a capacity of about 25,000 tons per year.

Ontario.

Brantford.—The Brantford Computing Scale Co. have completed an addition to their plant which will enable them to double their output for 1920.

Camden East.—A new company, Specialties Paper Mills, Ltd., capitalized at $325,000, has been formed to take over and operate the paper mill here. The president is L. F. Houpt, president of the George Irish Paper Co., Buffalo. A limited quantity of newsprint will be manufactured for a time, but ultimately it is intended to manufacture full vegetable parchment and high-grade specialties.

Chatham.—The Chatham Woolen Mills, operated by T. H. Taylor Co., Ltd., have been making additions to their scouring plant and installing a large Sargeant wool drier.

The Canadian Fertilizer Co. are making additions to their plant which will increase its capacity about 25 per cent. An extension 48 feet square is being made to the present main factory building, at a cost of over $3,000. Reinforced concrete storage bins are being installed, 60 x 100 feet, at a cost of nearly $6,000. The addition, with the new machinery being installed, will bring the capacity of the plant up to about 2,000 tons per year.

Espanola.—The Spanish River Pulp & Paper Mills have installed two new paper machines, which necessitated the erection of a new plant house.

Georgetown.—The Provincial Paper Mills are building two additions to their coated paper mill here. An extension is being made to the finishing room, and a new color room is also being erected.

Hamilton.—Canadian Westinghouse Co., Ltd., have let contracts for the remodelling of their west-end plant. When completed it will be used for the manufacture of Tungsten lamps, and production is expected to start this spring.

Guelph.—The Taylor-Forbes Co., Ltd., are building a new furnace in the core-room of their hardware plant and adding an extension, 70 x 100 feet, to their hardware foundry.

Galt.—The Perfect Machine Co. have doubled the capacity of their moulding shop. During the past year they commenced the manufacture of grey iron and semi-steel castings for the jobbing trade.

Dominion Linens, Ltd., have added a threshing and cleaning mill to their plant, and are now in a position to carry through the process of manufacturing linens from the growing of the flax to the finished product. The mill is run in operation with Flax Spinners, Ltd., which latter organization attends to all processes up to the spinning of the thread.

New Toronto.—Three extensions and two smaller buildings are being made to the plant of the Goodyear Tire & Rubber Co.

Paris.—The G. W. McFarlane Engineering Co. is contemplating inaugurating a wire manufacturing business.

Peterborough.—Two new buildings are under construction for the Canadian Woolens, Ltd., the new textile company which merged the Auborn Woolen Co. and the Bannerworth Co. of Peterborough with the Standard Woolen Mills Co. of Toronto. One of the new buildings is 140 x 56 feet, three storeys and basement, costing $50,000, where fine worsted yarn will be spun on the French or dry-spun system. The other building, costing $35,000, will be used as a weaving shed.

The Nashua Gummed & Coated Paper Co., of Nashua, N.H., are planning to locate a factory here in the building recently owned by Stickney Motors, Ltd. The plant will produce sheet gummed paper, cloth-lined papers, sealing tape and waxed papers of all grades.

Port Arthur.—The Great Lakes Pulp & Paper Co., a recently formed concern, will establish a pulp and paper industry at the north city limits, at an investment of $5,000,000. The president is Lewis L. Alstead, of Appleton, Wisconsin, and associated with him are George Seamon, of Chicago, and James Whalen, of Port Arthur. The plant will cover 100 acres. The ground wood mill will have a capacity of 30,000 tons per year, the sulphide mill 75,000 tons, and the print mill 35,000 tons. A maximum of 12,000 horse-power has been contracted for the new plant from the Ontario Hydro-Electric Power Commission; power to be obtained from development of the Nipigon.

The Cowan Company, Ltd., cocoa and confectionery manufacturers, are erecting a new seven-storey addition, at a cost of about $1,000,000.

Oakville.—The Oak Tire & Rubber Co., Ltd., propose enlarging their factory next spring by the addition of another storey, 200 x 60 feet. Additional machinery is now being installed to take care of the present increased business.

Ottawa.—The Bishopric Wall Board Co. are replacing their plant destroyed by fire last August by erecting and equipping buildings to give 50 per cent. more output.

Owen Sound.—The Federal Cement Co. has been incorporated to acquire plants here formerly operated by the Union and Imperial cement companies. These will be remodelled to a capacity of 2,000 barrels daily.

Thorold.—Judgment was given at Toronto by Chief Justice Falconbridge in favor of the Attorney-General of Canada in his suit against the Thorold Pulp Co. for surplus water used above the conditions of a 21 year lease to draw water from the old Welland Canal for manufacturing purposes. The company was assessed $16,949 for the surplus water used.

Trenton.—A new company, the Mineral Dye Products Co., Ltd., have taken over under special exemption arrangements a building formerly used for cold storage, and are installing a modern plant for the manufacture of high-grade mineral dyes for woolens, serges, tweeds, silks, etc., and for the paper industry. Ore will be secured from a property near the Rideau Canal, eighteen miles from Ganonoque, which will be conveyed in barges from the mines to Trenton. The company also expect to manufacture paints as a side line. Production is hoped to begin this month. The officers of the company are: E. M. Todd, president; J. W. Scott, Toronto, director; W. E. Lehotsky, chief chemist and manager; Eben James, Trenton, secretary-treasurer.

Toronto.—The Imperial Optical Co. have built and installed forty automatic multiple Toric lens grinders and polishers, and are now manufacturing lens on a factory basis production, using the same methods employed by the largest lens manufacturing plants in the United States.

The Toronto Carpet Co., Ltd., have recently completed a large building on Mowat Avenue, adjacent to their present plant, and will eventually extend it north to King Street. It has been erected to house the carding and spinning plant, which required extra space to take care of the large demands upon it from the carpet department and the Barrymore Cloth Co.

The Dunlop Tire & Rubber Goods Co. plan to expend $250,000 in new buildings.

The Northern Aluminum Co. hope to be located in their new ten-storey building on Sterling Road this spring. The new building is 151 x 64 feet, ten storeys and basement, and the cost is estimated at $358,000.

Windsor.—The British-American Brewery Co., Ltd., are erecting a new bottling shop, 140 x 70 feet, at an approximate cost of $75,000. Their present stock house is also being enlarged, increasing its capacity by 5,000 barrels, equipping it entirely with glass-lined steel tanks.

The Auto Specialties Co. of Canada have purchased a site of ten and a-half acres, on which they will erect a modern malleable iron foundry. The malleable iron will be used principally for themselves in the making of iron motor car parts, but they will also take on some custom work.

Walkerville.—The Eclipse Machine Co., of Elmira, N.Y., have purchased at a price said to be $40,000 the factory of the Cott-a-lap Co., of Walkerville, Ont. The Eclipse Co. will manufacture brakes, clutches, etc. The Cott-a-lap Co. manufactured jute for panelling walls, but owing to shortage of material during the war were forced to suspend operations.

Walkerville.—Work on the two new factories of the Canadian Products, Limited, a subsidiary of General Motors of Canada, Ltd., is rapidly nearing completion. Both buildings are 600 feet x 160 feet, single storey, steel and concrete construction. One plant will be used for the manufacture of motors for automobiles, and the other for transmissions and axles. The total investment is $5,000,000.

The Dominion Forge & Stamping Co., Ltd., are doubling the capacity of their board hammer shop, and are installing a new 8,000 pound steam hammer.

Welland.—Eleven hundred tons (41 carloads) of electro carbons were shipped recently from the plant of the Electro Metals Co. here, direct by the vessel, the Lake Falama, to Norway.

Endeavors will be made to form, for the Niagara district, a Niagara District Industrial Congress, for the purpose of effectively advertising the resources and industrial possibilities of the Niagara Peninsula. The congress will be held, probably in June next, and the co-operation of the

Boards of Trade of Thorold, Niagara Falls, Welland, Port Colborne, Fort Erie, Bridgeburg, Dunnville, Merritton, St. Catharines and Hamilton will be secured to make it a success.

Quebec.

Montreal.—The Dougall Varnish Co., who are associated with the Murphy Varnish Co., Newark, N.J., have completed the erection of an addition to their plant.

The Holland Varnish Co. are making an addition to their plant.

B. J. Coghlin Co., Ltd., railway supplies, are adding another floor to their machine shop. Fuel oil equipment is also being installed in their forge shop, the use of coal being discontinued.

The Gates Refractories, Ltd., have taken over the factory formerly occupied by the Art Furniture Co., and are turning out furnace fire-brick at the rate of 300 tons per month. The buildings acquired are of two-storey brick, with 12,000 feet of floor space. Two kilns of 50 and 60 ton capacity are in operation, and two other 60-ton kilns are rapidly nearing completion.

The St. Lawrence Welding Co. have commenced the operation of welded and steel tanks in addition to their regular business.

Quebec City.—The Citadel Brick & Paving Co., Ltd., by the end of this month hope to have plant enlargements completed which will increase their annual output from eighteen to thirty-five million. Four kilns are being added of a capacity each of 100,000 bricks, while twelve 110-foot waste heat dryer tunnels are being installed. Cost of enlargement, $100,000.

Quebec.—A new cold storage building, 172 x 46 feet, four storeys high, is being erected by the Quebec Brewery, La Brasserie Champlain. The new building will have a capacity of 60 vats of 5,000 gallons each. During 1920 the firm plan to erect a new bottling department, new power house and a second brew house with a capacity of 250 bottles per brew.

BORAX IMPORTS.

One of the most important import trades in Canada is that of borax. So far no commercial deposits of borax have been found in Canada, and, in fact, the only occurrence known in America of Commercial value is in the Inyo County, Death Valley, California, where it occurs as the soda lime borate known as colemanite. A small deposit has been found in New Brunswick, but this of scientific value only. Therefore all the borax used in Canada is imported. The returns from the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa, give the following data regarding borax imports: Imports of borax from the United States during the seven months ending October, 1919—2,096,824 pounds, valued at $160,923; for same period in 1918—1,471,264 pounds, valued at $114,250; for same period, 1917—3,303,213 pounds, valued at $271,952. Total imports of borax from the United States in 1918 were 4,164,749 pounds, valued at $327,123, as compared with 3,774,281 pounds in 1917, valued at $269,097. The imports of borax from the United Kingdom have been steadily decreasing each year from 992,603 pounds in 1915, 365,681 pounds in 1916, 359,937 pounds in 1917, 105,395 pounds in 1918 to 2,240 pounds to December 1, 1919 The deposits in California are worked by a British company, Borax Consolidated, Ltd., with its subsidiaries. This company are the largest operators of borax in the United States.

OIL COMPANIES ACTIVITIES.

The new refining and storage plant of the Imperial Oil Co. at Halifax, N.S., has cost in construction already a sum not less than $3,000,000, and the work is still proceeding. The further work, in addition to the $3,000,000 already spent, is with a view towards the development of the export trade to Europe. To accomplish this the company is faced with an expenditure of capital almost, if not quite as great, as that already made. However, the company is confident of the success that awaits the development of the export trade to Europe. It is calculated that a steamer can come to Halifax from Mexico with a cargo of crude oil and get away again with her tanks full of refined oil without the loss of twenty-four hours in the process. This is not saying that the same steamer would be used for both trips, but illustrates the speed with which entering the harbor, discharging the crude and reloading with the refined can be done.

The British-American Oil Co., after negotiations which have extended over eighteen months, has decided to erect a $100,000 plant at Hamilton, Ont. Five acres on the waterfront have been secured from the Oliver Chilled Plow Co.

GERMAN POTASH CONTRACTS.

Sir Auckland Geddes, President of the Board of Trade, in reply to a question by Mr. R. B. Chadwick (House of Commons, October 22) said, only one contract for potash needed by the Government had been placed abroad by the Board of Trade since the Armistice to date. This was a contract entered into with the German Government representing an amount of £750,000.. The contract was entered into in order to secure necessary supplies for the United Kingdom. It also provided a means whereby the German Government might pay for a portion of their imports of food.—The Chemical Age, London, Eng.

NEW PREST-O-LITE PLANT FOR TORONTO.

The Canadian National Carbon Co., Ltd., and the Prest-O-Lite Co. of Canada, Ltd., have jointly purchased the westerly ten acres of the property at the southwest corner of Bathurst and Davenport Road in the city of Toronto. known as the Hillcrest Driving Park, as a site for a large new manufacturing plant.

The new plant, which is to be erected in Toronto. will be a modern one, and will consist of two buildings, one of which will be 80 feet wide by 400 feet long, two storeys high, with one section 80 feet by 80 feet, three storeys high, to be occupied by the Canadian National Carbon Co., Ltd., while the second building, for the Prest-O-Lite Co., will be 80 feet wide by 400 feet long and two storeys. It is expected that the new plant will be ready for occupancy in May next. Mr. R. H. Combs, who has been general manager of the Prest-O-Lite Co. for the past three years, is also general manager of the Canadian National Carbon Co., having been recently appointed to that position. In the spring a new acetylene gas plant will be erected in Toronto or immediate vicinity for the increased demand for Prest-O-Lite gas for welding and cutting, and a large new storage battery warehouse and assembly plant will be erected in Winnipeg.

The Bethlehem Steel Company and the United States Steel Corporation have purchased large deposits of iron ore in Brazil.

THE MICA INDUSTRY.

Acting Trade Commissioner C. G. Venus, London, Eng., has presented a report to the Department of Trade and Commerce, Ottawa, on the mica market in the United Kingdom, and the feature of the report that is especially important to Canadian producers of mica are the quotations showing that the exports of mica from Canada to the United Kingdom have steadily declined in recent years, whereas shipments from India have increased.

Before going further into the report it might be well to state that there are two methods by which mica is disposed of after it reaches England: by auction or by private sales. The auction sales of mica in London, Mr. Venus points out, are attended not only by United Kingdom buyers, but also by Continental, American, and other merchants and users, all of whom compete openly for the supplies offering. Private sales are effected by negotiation between the importing broker and the buyer. London is the hub of the trade and the bulk of the business is done through a few well-known firms.

Causes of Canadian Declines.

The chief causes for the decline in imports of Canadian mica are lack of care and uniformity in preparation and grading, and the inclusion of mica of inferior quality in the shipments which is quite unsuitable for the requirements of the British market. The result is, low prices are realized for Canadian mica and there is consequent dissatisfaction on the part of the Canadian consignors. These departures from the correct and successful method of doing business are made by the Canadian shippers doing business in a small way, and who are inexperienced in exporting or engage spasmodically in the trade to the ultimate detriment of the Canadian industry as a whole. The figures for imports of mica from Canada, as given in the report, speak plainly—in 1913, 1,383 cwt.; in 1914, 1,225; in 1915, 1,864; in 1916, 879; in 1917, 444; in 1918, 480. Shipments from India, on the other hand, run from 40,178 cwt., in 1913, steadily up each year to 66,401 cwt. in 1918. Canadian amber mica differs, of course, in its characteristics from the so-called "white" mica of India, to which it is admitted to be superior in some respects; but although its qualities are well known and appreciated by British importers, the bulk of the present receipts are handled by a Lancashire firm who have, unlike the London brokers, always been enthusiastic supporters of Canadian mica, and who, it is understood, find their chief outlet with electrical enterprises of trans-Atlantic origin who, being familiar with the Canadian product, stipulate particularly for it in their contracts.

A Remedy Suggested.

A remedy that has been suggested for the shortcomings of Canadian methods is the formation of a combination or organization of shippers with a view to adopting a systematic and uniform practice in order to ensure efficient and careful grading and the introduction of a unified system of marketing, which would obviously operate very strongly towards removing the present disfavor with which the Canadian industry is at present regarded among importers.

In spite of the cessation of government demand, prices for mica in great Britain remain firm, and there is no tendency for the prices of good quality mica of large dimensions to recede. The market is, however, overstocked with poorer grades which are not expected to realize the figures expected by shippers. Roughly speaking, well-trimmed mica ranges in value in London from 6d. to 8d. per pound for the small sizes (i.e., 1-inch and 2-inch), up to as much as 15s. for large and perfect sheets.

Views of the Trade.

The preference for Indian mica, which is evident among most of the importers, is due chiefly to the excellence of its quality, its relative low price, and the systematic methods of grading and marketing followed by Indian shippers. The low cost of labor in India is, of course, a determining factor in the matter of the low price asked for Indian mica. One of the leading London dealers stated, in reply to a communication from Mr. Venus, that there would be, in his opinion, a very good demand for Canadian mica in Great Britain in the near future, and that the prices received would be satisfactory to the miners. Another dealer emphasized the importance of the better trimming and cutting of Canadian mica. Mr. J. Forsyth Smith, Canadian Trade Commissioner in Liverpool, states that some criticism is offered of Canadian amber mica as containing too large a proportion of iron (about 2 per cent.), also of the condition in which much of it is shipped. Indian producers grade and cut out all inferiorities, whereas the Canadian product frequently comes forward full of cracks and fissures and without due maintenance of desirable standards.

Suggestions for Shippers.

A Liverpool firm of mineral brokers offer the following suggestions to shippers:

1. The slabs when mined should be split down to ⅛ inch in thickness, and then trimmed roughly rectangular in shape, free from all flaws and cracks.

2. The plates should split freely, and be perfectly smooth and flat. Cross-grained or wavy plates must be carefully eliminated.

3. Only mica of a uniform quality should be packed in the same case.

4. It is desirable only to include in the same case mica of approximately the same size; and the plates should not vary more than one inch in length, but if sufficient quantity of one size cannot be obtained to fill a case, additions can be made by dividing various sizes of mica with a piece of sacking. The cases should be made of strong and sound wood, and contain 100 to 150 pounds of mica, no packing being required.

5. There is a demand for all sizes of mica, and as regards most qualities, the value increases in proportion to the length of the plates. Roughly speaking, the smallest merchantable dimensions are 2 by 3 inches, although there is a small demand for plates less than 2 inches wide, provided they are at least 4 inches in length. Smaller sizes than the above or scrap mica, scarcely realize the cost of freight and charges.

The Mica Mines in Canada.

There are several mica mines in operation in Canada. The chief centre of the industry is at Ottawa, the deposits occurring on both sides of the Ottawa River. One of the mica factories, where it is trimmed and prepared, is situated at Kingston, Ont.; another at Sydenham, Ont.; and five at Ottawa. Mica is used extensively in the electrical industry, for motor and dynamo winding, as insulators, insulation of light sockets, as long narrow slips on which fuses are mounted for telephones, and other uses.

DEVELOPING POWER IN NOVA SCOTIA.

Two water-power plants are in course of development in Annapolis Valley, one near Berwick, the other on the Gaspereau. The latter will develop 400 horse-power.

Government Publications

By S. J. COOK

(NOTE: Recent Government publications of scientific, technical or educational value are reviewed here from month to month. Unless otherwise stated, these publications may be obtained free by those interested, upon application to the Department of the Government issuing the same.)

Commission on Conservation.

Water Powers of British Columbia. By Arthur V. White. 644 pp; 36 plates; 10 diagrams; 3 maps. Bound in cloth.

This volume completes the series of reports, the preparation of which was undertaken by the Commission in 1910. It is explained in the foreword that publication of the volume now under review was delayed for some time, due to the exigencies of war time. The previous reports of this series are: Water Powers of Canada, published in 1911; and Water Powers of Manitoba, Saskatchewan and Alberta, 1916.

The present report is a compendium of data relating to the water power resources of British Columbia. The opening chapters comprise a statement of the guiding principles which should govern in the conservation and utilization of inland waters, and a description of certain important features which should characterize reliable water power data. There follows a comprehensive historical survey of water legislation in the province, together with discussions of subjects cognate thereto.

In the portion of the report which deals more particularly with physical data there are tabular lists of the estimated possibilities of water power development throughout the province, which are based chiefly upon results obtained by the field investigations carried on by the representatives of the Commission Stream-flow data, meteorological data and other hydrometric records are freely drawn upon to complete the compendium, and a bibliography, classified so as to make it easy for the reader to find the literature of the subject in which he is interested in relation to the subject of the book, takes up the last eighteen pages of the volume.

The British Columbia Government, through its Minister of Lands, supplemented the appropriation made by the Commission, and in this way expedited the work, as larger parties were placed in the field and the work was consequently done in a shorter time than would otherwise have been possible.

The expression "compendium" used above describes the volume more adequately than most other words would, for, although some original work is included, the value to the general reader will undoubtedly be based upon the fact that it contains within its covers practically all the available information on the subject with which it deals.

Department of the Interior.

Dominion Water Power Branch.—Water Resources Paper No. 27. Central Electric Stations in Canada. Part II. Directory. By J. T. Johnston. 252 pp., 1 map.

By those who read this column, it will be remembered that Part I. of this report was reviewed last month under the publications of the Dominion Bureau of Statistics. The Bureau and the Water Power Branch co-operated to produce this report and the statistical part was published by the Bureau, while the one now reviewed, which describes the various plants throughout Canada engaged in the production for sale of electrical energy, is being issued from the Water Power Branch. This very estimable agreement between Government Departments avoids duplication of effort, and at the same time gives everyone the results wanted. The Directory includes a total of 765 central electric stations, of which 534 generate their own power and 231 purchase power; 987 municipalities are recorded as being served with electrical energy. The names of the plants are arranged in alphabetical order by provinces, and the address of the company and the plant, as well as data regarding the installation and distribution, are given. A map, showing a key-plan of the index division of the Dominion of Canada, accompanies the report.

Dominion Bureau of Statistics.

Report of the Coal Trade of Canada for the year ended March 31, 1919. This report, prepared in the Internal Trade Division of the Bureau, includes summary statistics of production and imports, but deals principally with the distribution of coal throughout the Dominion. Data relating to capital invested, wages paid, and labor, taken from the Industrial Census, are also given. Six tables of prices are included as of general interest, and several appendices contain information relevant to the subject of the publication.

Monthly Bulletin of Agricultural Statistics. October, also for November. The October number contains a short article by Dr. F. J. Birchard, of the Dominion Grain Research Laboratory, on the subject of Milling and Baking Tests of Canadian Wheat. The customary data on the crop conditions are given.

Census of Industry, 1917. Planing Mills, Sash and Door Factories. 33 pp. The statistics of the above-mentioned factories were collected during 1918 as for the year 1917, and show production and agencies of production in a series of tables. There is also a general introduction, and all written matter is in both English and French.

Census of Industry, 1917. Wood Distillation. 25 pp. Referring to the industries engaged in the distillation of wood. This bulletin is another of the series to which the preceding review refers, and the data are arranged in a similar way.

Commercial Intelligence Branch.

Weekly Bulletins Nos. 826-828.

Page 1134. The cement industry of China has reached sufficient importance as to be able to supply all present needs at a price lower than the imported article can be sold for at the present time.

Page 1174. There is a considerable demand in China for asbestos products for pipe insulation.

Page 1182. Norwegian Pulp and Paper Prices. Export is advancing.

Page 1246. Trading in Spain. Part three of a series by Trade Commissioner Clarke.

Department of Mines.

Geological Survey.—Museum Bulletin No. 30. Gabbros of East Sooke and Rocky Point. By H. C. Cooke. 48 pp. 1 map. This bulletin describes two plutonic masses of general gabbroid composition which occur on the south-western coast of Vancouver Island, about fifteen miles southwest of the city of Victoria, the larger of which is of economic interest because it forms the country rock of the East Sooke copper deposits. The ores consist largely of chalcopyrite, disseminated throughout the hornblendite mass, and varying in amount from zero to 100%, but averaging (in the good ore) about 5 or 6% copper. Some of these deposits are of good prospective value, due to their size and persistence. A second type of deposit, subordinate in quantity and value, is the magnetite pyrrhotite deposit, which is similar to that at Sudbury. These latter are too

low grade in copper to be even of prospective value, but may at some time be utilized for the manufacture of sulphuric acid.

Memoir 114. Road Materials Surveys in the City and District of Montreal, Que. By Henri Gauthier. 52 pp., 4 plates, 1 fig., 1 map. The great and growing importance of the city of Montreal as an industrial centre makes the subject of road materials one to which more and more attention must be paid. During the field season investigations were conducted, and the results of these studies are set down in this bulletin. The available road materials are described, and the deposits examined are considered separately and in detail. A map accompanies the bulletin.

Geological Survey (Continued.) Summary Report, Part "A." Report of the Directing Geologist. 20 pp. These twenty pages review briefly the work of the Geological Survey during 1918. The various branches of the survey's work are described, and to those unfamiliar with the extent and varied activities of this department of the Government service this little pamphlet will be enlightening. The locations on which each of the men worked are given, and the expenditures in this, as well as in the other connections, are itemized. The appropriation for the year was $518,522.50, of which $419,518.11 was spent.

Map. Anyox, Observatory Inlet, Cassiar District, B.C. Scale 1/12000; 1000 feet to the inch. Geological formations from topography, by F. S. Falconer.

Department of Health.

Food and Drug Laboratory.—Bulletin No. 431. Sweet Spirit of Nitre. 6 pp. 184 samples of sweet spirit of nitre were examined, and 46 were found below the requirements of the pharmacopoeia in their content of ethyl nitrite (i.e., below 1.52% by weight).

Department of the Naval Service.

Sea Fisheries Statistics. 12 pp. Quarterly review of the catch of the fish on Canadian coasts; also for the United States and for Great Britain and Norway.

Department of Agriculture.

Seasonable Hints, November. 16 pp. A series of notes by various members of the Experimental Farms, written for the guidance of the farmer in his work.

Geology and Mineral Deposits of a Part of Amherst Township, Quebec. Memoir 113. By M. E. Wilson. 2 maps, 7 plates, 3 figs. Kaolin and graphite are found in the Amherst district and the geological records set down in this memoir deal principally with these two minerals and their occurrences. The district lies midway between Ottawa and Montreal, about thirty miles north of the Ottawa River, and is accessible from the C.N.R. at its Huberdeau Branch terminus. Kaolin, kaolinic quartzite, cornish stone, graphite, amber mica, and dolomite are the principal mineral materials of commercial value so far discovered in the St. Remi district, and the first four occur in the region studied and here described. The Canadian China Clay Co. operates the claim. Considerable data are given explanatory of the formation of the various deposits and the several excellent plates add to the usefulness as well as to the attractiveness of the bulletin.

SCHOLARSHIPS FOR STUDENTS IN SCIENCE.

The International Nickel Co. has established four scholarships for four-year courses in some department leading to a degree in science at any one of the three universities, McGill, Queen's or Toronto. The scholarships are sufficient to cover all expenses, and are open to employees and their sons who are connected with the mining and smelting division at Copper Cliff, Ont. Students are selected by competitive examination.

LABOR AND 'TS RESPONSIBILITIES.

At the annual meeting of the American Mining Congress, held at St. Louis, Mo., in November last, Mr. Charles Piez, President of the Canadian Link-Belt Co., delivered an address on the present labor situation in America that was listened to most attentively and that created a marked impression on the delegates assembled. This was not the first time that Mr. Piez had spoken on labor problems, and he is considered an able authority on matters industrial. Mr. Piez is not narrow in his views. He sees both sides of the great labor question, but he never hesitates to place blame where he believes it belongs or to "call a spade a spade." He outlined three steps or measures that should be taken to meet the present situation. First, that immigrants to the United States should be "hand-picked" in the future, and troublesome examples returned to their native country. Secondly, the creating of an impression on labor leaders of the necessity of getting a proper conception of what wages are and who pays them. Said Mr. Piez on this point:

"Among the many economic delusions of the day is the one that capital pays wages, and that high wages can be paid out of profits and surplus, or out of capital itself without increasing output or advancing prices. Not only workmen, but many of our legislators, forget that capital, as applied to the industries, represents investment in property, in machinery and equipment, and in material in process of manufacture, and that the cash to meet wages, the cost of materials, of power, and all the other expenses involved in manufacture, must be secured out of the selling price of the product, out of the money derived from the user or consumer."

The third and final step was to insure that large incorporated associations of either employers or employees be brought within the reach of civil processes in every jurisdiction. Great harm can be done the public, declared Mr. Piez, by large associations, who do not accept any responsibility for the acts of either their individual members or their leaders. A law should be enacted, providing that any voluntary association of seven or more members may sue or be sued in the name of the association. An act should be passed, said Mr. Piez, which, while not depriving men the right to strike when that appears to be the only way to meet the economic pressure exerted by their employers, yet, in its clauses, would instill into the minds of organized labor a proper sense of responsibility for acts which will cause harm or damage to other parties involved in a labor controversy.

NEW BRANCH OF ENGINEERING INSTITUTE.

Over one hundred guests were present at the opening of the 18th Branch of the Engineering Institute of Canada, at Peterborough, Ont., on November 6th last. The official charter of the Institute was presented to the Peterborough Branch President, R. Munro, by Lieut.-Col. R. W. Leonard, of St. Catharines. The following were among those present: Lt.-Col. R. W. Leonard, St. Catharines; Walter Frances, Montreal; Prof. H. E. P. Hamilton, University of Toronto; R. A. Ross, Montreal; Fraser S. Keith; J. B. Challies, Toronto; A. H. Harkness, Toronto; Frank Barber, Toronto; Prof. Peter Gillespie, Toronto; and James White, Ottawa.

The Volta Manufacturing Company, of Welland, Ont., have installed an electric furnace for Hiram Walker & Sons, Ltd., metal products plant at Walkerville, Ont.

BUSINESS CONNECTIONS FOR CANADIAN EXPORTERS.

(The names and addresses of the firms making these inquiries can be obtained only by those especially interested in the respective commodities upon application to "The Commercial Intelligence Branch of the Department of Trade and Commerce, Ottawa," or the Secretary of the Canadian Manufacturers' Association, Toronto, Montreal, Winnipeg, Amherst, N.S., and Vancouver.) In writing correspondents should quote the number of the inquiry.

3177. **Soap.**—A Dutch firm, established in London, wishes to get in touch with Canadian exporters of soap.

3181. **Cement, Soaps.**—A London firm report a market in West Africa for these Canadian products.

3186.—**Iron and Steel Bars, Gas Pipes, Leather.**—A London firm want these supplies for Portuguese, Grecian and near Eastern markets.

3187. **Mica.**—A Manchester firm wants 160 and 200 mesh.

3188. **Barytes.**—A Manchester firm inquire for "satinite" or fine ground barytes. Sample wanted with prices.

3189.—**Phosphate and Pyrites.**—A Manchester firm. Samples and prices.

3190.—**Minerals.**—A Manchester firm. Small samples with prices.

3194. **Opticai Goods.**—A London optical specialist wants optical goods suitable for high-class optical house, such as extra heavy and strong G/F frames, high quality, periscopic and meniscus lenses (spherical), white and tinted, etc. Catalogues requested.

3195. **Mineral Water Bottles.**—A Johannesburg, S.A., firm.

3196. **Leather, leather imitations in cloth.**—A Milan, Italy, firm.

3205.—**Raw and Tanned Leathers.**—A Genoa, Italy, firm.

3209. **Hides, Skins, Tanning Extracts, etc.**—A Turin, Italy, firm.

3211. **Tanned Leathers.**—A Genoa, Italy, firm.

3216. **Glass.**—A French doctor at Rouen, France.

3217. **Raw Materials.**—An agent in Lyons, France, for industrial purposes.

3218. **Mineral Oils, Fats.**—An agent in Marseilles, France.

3226. **Chemicals.**—A Barcelona, Spain, chemical firm inquire for acetone, acetic acid and chemical products.

3234. **Fertilizers.**—A Valenca firm.

3235, 3236, 3237, 3239, 3240, 3259, 3260, 3263, 3264, 3269, 3270, 3273. **Machinery, Iron and Metal Goods, Chemicals, Heavy Chemicals, Asbestos, Chemical Products, Electric Supplies, Abrasive Wheels.**—Firms in Barcelona, Spain, wish these products.

3283. **Belting.**—A Naples, Italy, firm wants belting, 60 to 400 mm. wide.

3284. **Iron and Steel Bars.**—A Naples firm.

3288. **Porcelain, Paper, Textiles.**—An agent in Bucharest, Roumania, with connections in Serbia.

3289. **Steel and Metals.**—An importer in Paris, France.

3291. **Drugs.**—French druggists.

3294. **Engineering Supplies.**—A London company.

3295. **Chemists' Supplies and Chemical Glassware.**—An importing firm in Port-of-Spain, Trinidad.

3297.—**Nickel and Stellite.**—Agent in Milan, Italy.

3299. **Ice-Making Machinery.**—A firm in Karachi, India.

3300. **Technical products: Machinery.**—An agent in Bucharest, Roumania.

3307. **Alcohol.**—A firm at Gibraltar.

3338. **Sulphate of Copper.**—A Catania, Italy, firm.

3354. **Oils, Chemical Products.**—An agent at Genoa, Italy.

3358. **Dyes, Metals, Machinery.**—An agent at Genoa, Italy.

3371, 3372. **Molybdenum and Tungsten.**—London firms.

3382. **Chemicals.**—A London firm.

3387. **Barytes.**—A firm near Glasgow, Scotland.

3423. **Minerals.**—A Manchester firm want feldspar, pyrites and allied products.

3439. **Copper.**—A Paris merchant desires copper and other minerals.

3445. **Chemicals, Machinery.**—An Athens, Greece, firm.

3464. **Oils and Oil Cake.**—A Marseilles, France, firm.

3466. **Graphite.**—A Paris purchaser.

3472. **Cobalt, Bismuth and Nickle Ores.**—A Swedish firm want quotations on these, c.i.f. Gothenburg and Hamburg.

3480. **Silver Residues.**—A London firm want supplies of silver residues from photographic hypo-solutions, and also of any other waste material containing precious metal.

INDUSTRIAL RESEARCH IN BRITISH COLUMBIA.

Dr. A. B. McCallum, Administrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research in Canada, recently paid a visit to British Columbia, where he conferred in Vancouver with members of the British Columbia Honorary Advisory Committee on several subjects of vital importance to the industries of the province. Perhaps the most important matter considered was the possibilities of establishing a plant in British Columbia for the manufacture of alcohol from the wood waste of the mills. Another point discussed was the possibility of utilizing certain high-grade iron ores. It is intimated that so far little evidence has been brought forward to show that there has been a sufficient development of the ore bodies in British Columbia on which can be based data warranting the establishment of an iron and steel industry on the coast.

Speaking of the possibility of establishing a plant in British Coumbia for the manufacture of alcohol from wood waste, Dr. McCallum stated that from the British Columbia wood waste, in all its forms, including slabs, strips and sawdust, which is estimated to amount to from 5,000 to 15,000 tons a year, it would be possible to manufacture 50,000,000 gallons of industrial alcohol annually. The market for this is assured, in that Great Britain will need in the future 300,000,000 annually to replace her rapidly decreasing petrol supply. He stated that a special committee formed in the Old Country to investigate the supply of alcohol has turned its attention to India, where it is possible to manufacture the product in large quantities from the "Mahu" flower, which is especially rich in glucose. This committee, he believes, is unaware of the immense possibilities in British Columbia, where the alcohol could be obtained from the wood waste and shipped cheaply by means of tankers through the Panama to Europe.

Another problem which the British Columbia Committee may underetake, at the request of the British Columbia Fruit-Growers' Association, is an investigation into the blight which destroyed large quantities of pears and apples in sections of the fruit-growing areas of the province.

The members of the British Columbia Honorary Advisory Committee include Dr. Judson F. Clark, R. F. Hayward, George Kidd, P. H. Moore, J. S. Raphael, R. H. Stewart, Campbell Sweeny, President Klinck of the University of British Columbia, H. R. MacMillan, Professor Douglas McIntosh, J. M. Turnbull, Dr. C. McLean Fraser of Nanaimo, and James J. Warren of Trail.

NEW YORK LETTER

Special Correspondence to the Canadian Chemical Journal by F. M. Turner, Jr.

New York, December 26, 1919.

The November meeting of the New York Section of the American Chemical Society, held at the Chemists' Club, New York, on the evening of November 7th, was devoted to a discussion of the cellulose industry. Dr. Wallace P. Cohoe, who is well-known in Toronto, in which city he received his chemical training, and where he for some years engaged in practice as a consulting chemist, read a paper. Dr. Cohoe is at present in practice as a consulting chemist, with offices at 111 Broadway, New York City, and is devoting special attention to the problems of cellulose manufacture and utilization. Other papers were contributed by Messrs. J. E. Minor, H. Bradshaw and R. G. Woodbridge, Jr.

The December meeting, held on the evening of December 5th at the Chemists' Club, featured two papers—one on "Modern Methods of Food Dehydration," by K. G. Falk, and one on "Emulsions," by A. W. Thomas.

New Jersey Chemical Society.

The New Jersey Chemical Society, an organization of chemists living and working in the various industrial towns of New Jersey, where there are so many chemical industries, held a very successful dinner at the Robert Treat Hotel, Newark, N.J., in November. Dr. Harvey W. Wiley, of pure food legislation fame, was the guest of honor. This society has planned a most interesting campaign of co-operation with the New Jersey State Department of Labor. The society will endeavor to advertise New Jersey as a centre of chemical industry, to attract new chemical industries to the state, to increase co-operation between the already existing chemical industries in the state, to make a survey of the raw materials for chemical industries found in the state, to improve facilities for the chemical education of young men in the state, promote co-operation between the industries and the colleges of New Jersey, provide Government departments with more accurate technical data regarding the chemical industries and products of the state than could otherwise be obtained, provide financial institutions with accurate data on the chemical industries of the state, thus facilitating the obaining of capital for chemical industries, etc.

A disastrous fire seriously damaged the property of the Engineers' Club, of New York, a few weeks ago. Fortunately, owing to favorable weather conditions and splendid work on the part of the New York fire department, the fire was prevented from spreading to the adjoining building of the Engineering Societies, which houses the library of the United Engineering Societies, which is one of the most valuable technical libraries in the world. This library is practically unique, in that it offers a collection of practically all the early works on all branches of applied science, many of which are priceless. It is especially rich in early works on electricity.

The marriage of Mr. A. E. Marshall, works manager of the Davison Chemical Company, Curtis Bay, Baltimore, Md., to Miss Ruth Marriott Hildebrandt, of Baltimore, has been announced. Mr. Marshall contributed a most interesting paper on "Recent Developments in Chemical Engineering" at the recent meeting of the Americal Institute of Chemical Engineers at Savannah, Ga. This paper points out the growing importance of modern material-handling equipment in simplifying chemical manufacturing operations. It is reprinted in the current number of the Chemical Age. New York.

Mr. Charles F. Roth, manager of the National Exposition of Chemical Industries, is enjoying a well-earned rest in Bermuda, after which Mr. Roth will return to New York and carry on preparations for the next Exposition, which already promises to surpass in size and interest any of its predecessors.

The Bayer Company, New York, manufacturers of synthetic chemicals, have been accused by the Federal Trade Commission of unfair practices in advertising their aspirin in such a manner as to convey the impression that their product is the only genuine aspirin, and that all other products sold as aspirin are adulterated and spurious. The Bayer company have been making a great deal of capital in their newspaper advertising out of the fact that an obscure firm was caught marketing alleged aspirin consisting largely of talcum. Of course, the patents on aspirin have expired, and a considerable number of American firms, as well as at least one in Canada, are making an excellent product, quite equal in quality to that of the Bayer company.

News Items.

The General Chemical Company, New York, are said to have taken over the works of the Western Chemical Company, of Denver, Colo., manufacturers of heavy acids and salts. According to local papers, about $2,000,000 was involved in the transaction, which is no surprise to the chemical trade, as there have been rumors to that effect for some time.

In the New York Tribune for December 25th appears a denial from President Handy, of the Semet-Solvay Co., that there is anything behind the rumors of a merger of that concern with the Barrett Company and the National Aniline & Chemical Company.

The American Sugar Refining Company is planning to replace its present Brooklyn refinery with a new plaut to cost in the neighborhood of $8,000,000. The new plant, which will be the largest of its kind in the world, will greatly exceed the capacity of the present refinery. The Brooklyn plant is only one of six plants operated by this concern. It is the oldest of the group, having been started shortly after the Civil War. It has a capacity of 4,000,000 pounds of refined sugar per day. The other refineries of the company are situated at Jersey City, Philadelphia, Boston and New Orleans.

The B. J. Johnson Company, of Milwaukee, Wis., manufacturers of soaps, are erecting a plant at Long Island City, N.Y.

A large plant, owned by the Cocoanut Products Corporation, which has been under construction for some time at Baltimore, Md., is rapidly nearing completion, and is attracting a great deal of attention, as it will be one of the most complete, as well as one of the largest, copra crushing plants in the world. The raw material will be brought from the Philippines, where the company owns extensive plantations. The concern is made up of Baltimore capitalists, and Mr. B. W. Rice is in charge of operations.

New Bureau of Mines Station.

The writer recently had an opportunity of visiting the new building of the Pittsburg Station of the United States Bureau of Mines, which was opened in September with

appropriate ceremonies. Although the headquarters of the Bureau of Mines is in Washington, the Pittsburg Station has long been one of the most important centres for research work, and a new and adequate building has been needed for some years.

Other stations are maintained at Salt Lake City, Golden, Colo., Urbana, Ill., Berkeley, Cal., Minneapolis, Seattle, Bartlesville, Okla., Fairbanks, Alaska, and Tucson, Ariz. All of these stations are under the immediate direction of Dr. Dorsey A. Lyon, who, in turn, is responsible to the head of the Bureau. Each station is chiefly occupied with work that is of special interest in that particular locality.

The Pittsburg Station, which is to be known as the Joseph A. Holmes Memorial Station, in memory of the distinguished first head of the Bureau, is to specialize in coal mining, the testing of explosives and ferrous metallurgy. Particular attention will be paid, as has been the case in the past at the Bureau's old premises at the old Arsenal in Butler street, to safety work in coal mining and first aid work.

A large power plant is connected with the Bureau, being advantageously located in a natural depression of the ground behind the main building. This power plant will supply steam and electricity for the building and laboratories, and will also serve for testing work in connection with fuel utilization. While designed with efficiency as the main point in view, the building is architecturally very handsome, and a worthy accession to the fine group of public and educational buildings in the Schenley Park section of Pittsburg. It is conveniently near the Carnegie Institute of Technology, the Carnegie Library, the University of Pittsburg and the Mellon Institute.

The entrance is handsome and dignified, and the ground floor is largely taken up with offices in the centre and laboratories in the wings. One wing is given over to a mechanical laboratory, two storeys in height. The main chemical laboratories are in the opposite wing on the first floor. Every facility for fuel and ore analysis is provided. Metallurgy is taken care of in the basement of one of the wings. Work will be carried on here on the metallurgy of iron and steel, aluminum, slags, electric furnaces, etc.

Very complete laboratories are provided for the study of explosive and suffocating gases. In connection with this work the Bureau maintains an experimental mine a few miles from Pittsburg, where large scale work of this kind can be carried on. The work of the Bureau along these lines has already contributed enormously to safety in coal mining, and it is expected with larger facilities much more valuable work will be done. It is interesting to note in connection with this work that during the war the Bureau's resources were utilized for coping with the problems of gas warfare.

Elaborate facilities are provided for the testing of explosives intended for mining use. In these laboratories new explosives will be tested and the properties and manner of use of established explosives further investigated. This department, too, was of great value to the Government during the war in testing various explosive materials and working out specifications for military supplies.

The workshops of the Station are very complete. Workers in metal and glass will be permanently employed to make any apparatus that may be required in connection with any research carried on in the laboratories. There are also extensive drafting rooms and photographic workshops. The photographic department includes facilities for taking and developing moving pictures to be used in mine educational work and in connection with research work and scientific lectures.

A good library is located on the second floor, containing all the leading works on the subjects dealt with at the Station, as well as files of several hundred technical and scientific periodicals. In addition to this, the Station is very near the Carnegie Library, the Technology Branch of which is one of the best technical libraries in America. A restaurant and rest rooms for the staff and employees are also provided. Finally, there is a fine auditorium for lectures and conferences.

This splendid institution will add to the already great scientific and technological importance of Pittsburg. With the exception of New York and Washington, there are probably more scientific and technical experts in the Pittsburg district than at any other point in America. The Mellon Institute requires the services of a large and varied staff for its numerous researches, touching on almost every conceivable problem of applied chemistry. The faculties and students of the University of Pittsburg and the Carnegie Institute of Technology form another group in which chemists and chemical engineers are a numerous element. The great steel mills, and such great organizations as the Aluminum Company of America, the Pennsylvania Salt Manufacturing Company, the Westinghouse Company, the Harbison-Walker Refractories Company, the American Vanadium Company, the Standard Chemical Company (the largest producers of radium in the world), the Scientific Materials Company, etc., all serve as nuclei to attract chemists.

Tanning of Sharks' Skin.

On Friday, November 21st, a most successful meeting of the Society of Chemical Industry was held at the Chemists' Club, New York. At the dinner preceding the meeting the piece de resistance was filet of shark, the shark being one whose skin was afterwards tanned, along the lines described by Dr. Allen Rogers. Dr. Rogers, who is a member of the staff of Pratt Institute, of Brooklyn, is a pioneer investigator of the possibilities of utilizing sharks and other sea fish for leather. He delivered a most interesting address on this subject. A company has already been formed to carry on shark fishing and to tan the leather, which is excellent for making travelling bags, etc., and for many other purposes, and the use of which will go far towards relieving the present leather shortage.

Mr. Henry Faber, of the Industrial Filtration Corporation, New York, spoke on "Modern Methods of Filtration." Mr. Faber has been very prominent in investigating filtration problems, and has invented a number of most useful and successful pieces of apparatus which have solved filtration problems in a great many industries. During the war Mr. Faber was in the service of the Government, investigating pyrotechnic problems. He is now working on an elaborate report on the technology of pyrotechnics, which is to be published by the Government.

Attitude of German Manufacturers.

Dr. Charles H. Herty, editor of the Journal of Industrial and Engineering Chemistry, has returned from his trip to Euope, where he went on a special mission relative to the procuring of certain vat dyes not at present manufactured in this country. Dr. Herty met many of the leaders of the chemical industry in Germany, and describes their attitude as "cocky." He returns to this country eager to urge on those interested in the American chemical industries that they should not deceive themselves as to the present status of the German industries. He thinks that they are all ready for an industrial war, and confident of their ability to win back their old position.

PERSONALS

Dr. R. B. Moore has been appointed Chief Chemist of the Bureau of Mines, in place of Dr. Charles L. Parsons, whose resignation becomes effective November 1st. Dr. Parsons resigned in order to give more time to the American Chemical Society, of which he is secretary, and for the interests of which he has been an indefatigable worker, and also to permit of his engaging in practice as a consulting chemist with offices in Washington, D.C.

Prior to entering the service of the Government, Dr. Moore was in academic work, being in charge of the chemical department at Butler College, Indianapolis. Dr. Moore has specialized in rare metals, radio-activity and allied subjects. He had charge of the experimental radium plant at Denver, Colo., built and operated by the Government. Dr. Moore offers every promise of being a worthy successor to his distinguished predecessor.

Dr. Harold Hibbert, who is well-known in Toronto, where he formerly engaged in the practice of consulting chemistry, has been appointed Assistant Professor of Organic Chemistry at Yale, and will have charge of post-graduate research in organic chemistry. He has recently acted as consulting chemist to a number of prominent American manufacturers of organic chemicals, and has just returned from a trip to England in the interests of one of his clients.

Mr. Linn Bradley, formerly Chief Engineer of the Research Corporation, who control the Cottrell process of fume precipitation in certain industries, is now engaged in consulting practice at East Orange, N.J., specializing in dust and fume collection.

Dr. L. H. Baekeland, the inventor of bakelite, was decorated by King Albert with the Order of the Crown of Belgium during His Majesty's visit to New York.

A fire at the plant of the Taylor Chemical Company, Pen Yan, N.Y., where carbon bisulphide is manufactured, did considerable damage, and caused several days' cessation of operations at the plant.

The Victor Chemical Works, Chicago, will erect a plant for the manufacture of phosphates from rock phosphate near Nashville, Tenn. This company's product is used chiefly in connection with baking powder manufacture.

Major A. Nagelvoort, who since receiving his discharge from the Chemical Warfare Service has been with the Matheson Alkali Works, Providence, R.I., is now with the Arnold Hoffmann Co., Inc., selling agents for the Matheson Works.

L. Sonneborn Sons, Inc., New York, manufacturers of textile oils, special chemicals, etc., are erecting a modern plant at Nutley, N.J.

Mr. F. H. Keys, who has recently been a memebr of the staff of the Iron Age, and who formerly was connected with Sweet's Catalogue Service, has joined the staff of the Chemical Catalogue Company, Inc., New York, as production editor.

Dr. Jerome Alexander, of New York, one of the most popular local chemists and well-known for his contributions to colloid chemistry, has been seriously ill at his country place in Connecticut.

It is stated that Proctor & Gamble, the large soap manufacturers, are to establish paper mills to manufacture paper from cotton linters. These mills will be located in the South, to be near the source of supply.

The Port Morris Chemical Works, Inc., New York, has filed a petition in bankruptcy, with liabilities of $275,389 and assets less than $10,000.

The French Government has granted to Prof. Gilbert N. Lewis, Dean of the College of Chemistry, University of California, Berkeley, Cal., the rank of Chevalier of the French Legion d'Honneur. Prof. Lewis served as lieutenant-colonel in the Gas Service, A.E.F.

Scientific research is not always encouraged. According to the local papers, the Federal authorities have been very inconsiderate regarding the chemical investigations being carried on in the laboratories concealed in the unofficial embassy of Messrs. Trotzky and Lenine in New York. A large amount of scientific material, such as T.N.T., nitroglycerine, ammonium nitrate, picric acid, sulphuric acid, etc., was carried off by the police.

LARGER EXPORT OF IRON ORES.

President D. H. McDougall, Colonel Cantley and Mr. W. D. Ross, of the directorate of the Nova Scotia Steel and Coal Co., are at present in Europe making arrangements for future development of the company. The company is especially interested at present in the expansion of their iron ore business. Coal from their mines has already been sold in Holland and in substantial quantities in the Mediterranean, most of this being exported from Canada in the company's own boats. The company have great hopes of building up a large market for their Wabana iron ore in Great Britain. Plans are now under consideration by the company for the enlargement of their shipyards so as to build ships up to ten thousand tons. Mr. McDougall, prior to his departure for Europe recently, emphatically denied that there was "anything" in the rumor that the Nova Scotia Company would amalgamate with the Dominion Steel and Coal Co. Whatever the opinion had been in the past, Mr. McDougall said, Scotia was not disposed to consider amalgamation at the present time. As to future prospects, Mr. McDougall declared that nothing very definite could be said concerning this winter, though he hoped to have a more extensive operation of the steel plant before many months. He was confident, however, that the present period of depression would be followed by ten or twelve years of the most prosperous business for Canada generally.

GERMAN LABORATORY SUPPLIES.

It is interesting to note that German manufacturers of laboratory apparatus and supplies are getting busy again and making enquiries for Canadian orders. During the past month a Toronto company received a letter and catalogue from a well known German firm advising them that they would be pleased to renew former business relations as soon as possible.

RESERVATIONS OPENED FOR MINING CLAIMS.

The Secretary of the Interior of the United States has designated certain parts of the following Indian Reservations in Arizona and New Mexico as being opened for the location of mining claims for metallurguous minerals:—San Juan Reservation, Navajo Reservation, Hoopa Valley Reservation, Tule River Reservation, Fort Yuma Reservation and the Morongo Reservation.

RECENT INCORPORATIONS.

Note.—The following companies have recently been incorporated. For business purposes communicate with the head office of the company, which is always at the city mentioned. Unless otherwise stated the concerns are both manufacturers and dealers in the products named:

Montreal.—The Elcaya Co. of Canada, Ltd. Capital, $10,000. Toilet articles, perfumes, etc.

Hamilton.—W. J. Westaway Co., Ltd. Acquired and reorganized. Capital, $200,000. Machinery, bleachers, dyers, vitriol.

Montreal.—Montreal West Milling Co., Ltd. Capital, $150,000.

Ottawa.—The Chemical & Engineering Co., Ltd. Capital, $50,000. Chemical, civil, mechanical, electrical and hydraulic engineers and contractors; metallurgists, chemists.

Montreal.—Federated Leather Goods Co., Ltd. Capital, $50,000. Leather and leather goods.

Hamilton.—Porritts & Spencer (Canada), Ltd. Capital, $1,000,000. Felts, fabrics, pulp, paper, linen, bleachers, dyers and makers of vitriol, bleaching and dyeing materials, cotton, cloth, woolens.

London, Ont.—The London Soap Co., Ltd. Capital, $250,000. Fertilizers, grease, oils, soap, glycerine, shellac, glue, paint, varnish, washing powders, medicines, shoe dressings, cements, powders.

Montreal.—Butler-Jobin Optical Co., Ltd. Capital, $100,000. Opticians, jewelers, gold and silversmiths, optical and scientific instruments.

Montreal.—The North American Chemical Co., Ltd Capital, $250,000. Chemists, druggists, dyers, oils, colors, pharmaceuticals, chemicals, cements, pigments, paints, varnishes; chemical, surgical and scientific apparatus.

Toronto.—The Charles E. Hires Co., Ltd. Capital, $15,000. Non-alcoholic beverages, extracts, milk products, desiccated food products, mineral waters.

Chandler, Que.—La Gaspesienne, Ltd. Capital, $100,000. Fish packers, cold storage plants; to experiment and make scientific researches in connection with the fish industry.

Montreal.—Canadian Coal Briquette and Liquid Fuel Co., Ltd. Capital, $70,000. Coal briquettes and liquid fuel; and to operate mineral claims.

Montreal.—Engineering Equipment Co., Ltd. Capital, $20,000. Mining and contracting machinery; mining and smelting business.

Bridgeburg, Ont.—Reliance Fuse Co. of Canada, Ltd. Capital, $500,000. Electrical goods and machines; to act as electrical, mechanical and chemical engineers in connection with the business of the company.

Toronto.—Ransome Canada Products, Ltd. Capital, $10,000. Mixing machinery for concrete, fertilizers, chemicals and ores.

Toronto.—The American Fuel Co., Ltd. Capital, $100,000. Coal, fuel, cement.

Calgary, Alta.—Western Agencies & Development Co., Ltd. Capital, $500,000. Mining, power and industrial enterprises.

Montreal.—Windsor Petroleum & Refining Co., Ltd. Capital, $700,000. Produce and manufacture petroleum, natural gas, oil, gasoline, salt, chemicals, metals, minerals, etc.

Hamilton.—Firestone Tire & Rubber Co. of Canada, Ltd. Capital, $5,000,000. Rubber tires and automobile parts and accessories.

Richmond, Que.—Dominion Narrow Fabrics, Ltd. Capital, $500,000. Linen, cotton, bleachers and dyers, bleaching and dyeing materials.

Toronto.—Baldwin's Canadian Steel Corporation.—Capital, $500,000. Iron smelters, iron and steel in all their branches of castings.

Montreal.—National Varnish Co. of Canada, Ltd. Capital, $50,000. Pigments, paints, oils, varnishes.

Sherbrooke, Que.—The Regal Tire & Rubber Co., Ltd. Capital, $750,000. Rubber tires and rubber goods.

Brantford, Ont.—Fairchild Engineering Co., Ltd. Capital, $50,000. Electrical, mechanical, hydraulic and civil engineers and contractors.

Montreal East.—The Canadian Aseptic Cotton Works, Ltd. Capital, $250,000. Aseptic cotton, absorbent cotton, etc., ether, chloroform, ethyl chloride, ethyl bromide, dyestuffs, superphosphate, soap, fertilizers, paints, dyes, oils, acid, alcohol, tar and tar by-products; cut, blown and pressed glass.

St. John's, Que.—Dominion Hair-Felt Co., Ltd. Capital, $25,000. Hair-felt and all kinds of insulating material.

Montreal.—Canadian Nathan, Ltd. Capital, $100,000. To acquire and operate the business known as the Canadian Chadwick Metal Co., Ltd., of Hamilton, Ont. Machinery, scientific instruments, founders, engineers; and to carry on business of chemical and fertilizer works, dye makers, metallurgists, etc.

St. Boniface, Manitoba.—Western Wheel & Foundries, Ltd. Capital, $2,000,000. Miners, engineers, machinists, smelters, founders.

Toronto.—Dominion Oxygen Co., Ltd. Capital, $100,000. Oxygen, nitrogen, argon and all other gases; any and all chemical and electro-chemical substances or products; also to mine and develop ores, gas, oil.

Toronto.—Canadian Inspection & Testing Co., Ltd. Capital, $40,000. Inspect, test and analyze all kinds of material and machinery and industrial processes; physical and chemical analyses, etc.

Montreal.—Edgar Allen & Co. (Canada), Ltd. Capital, $50,000. Steel, iron, metals, coal, iron founders, etc.

Yorkton, Sask.—Canada Drugs, Ltd. Capital, $50,000. Drugs and chemicals, glass and glassware; chemical, surgical and scientific apparatus.

Montreal.—Scientific Experimenter Co., Ltd. Capital, $100,000. Amateur and experimental wireless telegraph and telephone, chemical, electrical, mechanical and scientific apparatus.

Montreal.—Olswarg Leather Specialty Co. of Canada, Ltd. Capital, $20,000. To acquire and operate the business carried on under the name of B. Olswarg, Trustee. Leather, leather goods and products.

Toronto.—Super-Cement (America) Co., Ltd. Capital, $500,000. Super-cement compound and preparations; hydraulic cement; tannic acid, chemical substances; contractors.

Montreal.—Dominion Engineering & Machinery Co., Ltd. Capital, $3,000,000. General engineers and contractors.

Vancouver.—Loomis, McFee, Henry & McDonald, Ltd. Capital, $500,000. General contractors.

Toronto.—International Bushings, Ltd. Capital, $25,000,000. Iron, steel, brass; engines, electrical, mining and pumping machinery, etc.

Lennoxville, Que.—Lennox Knitting Mills, Ltd. Capital, $75,000. Cotton, woolen and silk goods.

BRITISH COLUMBIA COAL TO WASHINGTON STATE.

The coal resources of the State of Washington were described by Professor Joseph Daniel, of Seattle, Wash., at the meeting of the Canadian Mining Institute at Vanocuver in November.

With an output of from three to three and a half million tons of coal annually, he said, the State of Washington probably had to contend with a higher cost of operation of its coal mines than any other State in the Union.

This was due to several causes. First, the high cost of labor, and second, what he termed "the structural" difficulties, practically the whole output of the State having to be washed before it could be placed on the market. The success of British Columbia coal on the Washington market he attributed to the high proportion of clean-looking lump coal, which appealed strongly to the householder for domestic use.

The work of the Granby Company of British Columbia in installing their own plant for producing coke has had considerable effect on the coking-coal market for the product from Pierce County, Washington. There had been a considerable falling-off in the demand for this product, but it was utilized in the Tacoma smelter and in other smelters in California.

COMPANY NOTES.

The directors of Messrs. Brunner, Mond and Co., Ltd., England, have issued a statement to their shareholders informing them that on October 8, 1919, they concluded an agreement to sell to Lever Brothers, Ltd., the ordinary shares in Joseph Crosfield and Sons, Ltd., soapmakers, Warrington; and of William Gossage and Sons, Ltd., soapmakers, of Widnes, which were acquired by Brunner, Mond and Co., Ltd., in the year 1911. The statement adds that the sale was made at a price which the directors considered a fair one, and was payable in cash and continues:

"In conveying this information to their shareholders, the directors desire to say that although this rearrangement of investments will obviate the necessity for any issue of capital for some considerable time, yet they see no reason to anticipate that the rearrangement will cause any increase in the amount of profits previously earned by the company, or the amount available for distribution."

It is reported from Liverpool that the price paid by Lever Brothers to Brunner, Mond and Co. for the acquisition of the ordinary shares of the two companies was four million pounds.

At a meeting of the National Steel Car Company directors recently held at Hamilton, Ont., it was decided to recommend to the shareholders that a proposal made by a syndicate of New York capitalists, headed by R. G. Magor, for the reorganization of the corporation be accepted. R. G. Magor is a brother of Basil Magor, who was at one time general manager of the National Steel Car Company.

The Galt Brass Co., Galt, Ont., have increased their capital to $500,000. They operate the following departments: Brass foundry, brass machinery shop, tool room, plating and polishing.

The Tavani Electric Steel Co., Belleville, Ont., are contemplating construction of a steel and iron foundry in Winnipeg. Estimated cost, $5,000,000.

CATALOGUES AND REPORTS RECEIVED

Link-Belt Electric Hoists and Overhead Cranes, Book No. 380, and Link-Belt Labor-Saving Elevators and Conveyors, Book No. 375.

We do not believe that anything superior to these two catalogues of the Link-Belt Company has ever been published in the line that they particularize in. In the matter of illustrations, especially, they are all that could be desired, and practically all of the different types of hoists are not only portrayed by clear-cut engravings, but also by cross-section views, showing the exact mechanism of each machine. The catalogue on electric hoists is subdivided into five sections: Electric hoists, mono-rail trackwork for electric hoists, electric telphers, overhead travelling cranes and revolving locomotive cranes. The one on elevators, conveyors and labor-saving devices includes descriptions of double boom bag pilers, bag conveyors, bag elevators, telphers for conveying bags, box pilers with capacity of piling 1,200 to 1,800 boxes per hour, bottle conveyors handling 8,100 bottles per hour, barrel and keg elevators, freight handlers and box car loaders. Any reader of this journal desiring these catalogues may receive them by writing to the Canadian Link-Belt Co., Ltd., Wellington and Peter Streets, Toronto. We recommend them to all plant superintendents especially.

Devine Apparatus.—The J. P. Devine Company, Buffalo, N.Y., have a model binder for holding the Bulletins which they issue from time to time descriptive of their industry and output. This is a beautiful heavy leather board cover, in between which the Bulletins may be filed for ready reference by simple fasteners. One just received contains Bulletins from 101A to 107. Every plant manager would undoubtedly find these Bulletins of good use, and would make no mistake by writing the Devine Company for any or all. The Bulletins are well illustrated, and describe thoroughly the following well-known Devine apparatus: No. 101A, Vacuum Chamber Dryers; No. 102A, Vacuum Drum Dryers; No. 103, Vacuum and Non-Vacuum Rotary Dryers; No. 104, Vacuum Drying and Impregnating Apparatus; No. 105, Devine Apparatus for the Color, Chemical, Dyestuff, and Allied Industries, describing in detail with excellent engravings such apparatus as autoclaves; nitrating, reduction, fusion, sulphurating, and tilting kettles; No. 106, High-Efficiency Single and Multiple Effect Vacuum Evaporators and Pans; No. 107, High-Efficiency Vacuum Pumps.

Blair, Campbell & McLean Evaporator Bulletin.—This is an eight-page illustrated catalogue, descriptive of the Multiple Effect Rapid Evaporators and the Simplex Patent Rapid Evaporating Apparatus. The booklet explains fully the working of these evaporators. A copy can be had by writing to Blair, Campbell & McLean, Inc., Colonial Trust Bldg., Philadelphia. Even if one does not need an evaporator right now, the information contained in this Bulletin is alone worth having on file.

MAKING OXYGEN AND HYDROGEN GAS.

The National Electro Products Co., 295 Dufferin Street, Toronto, have equipped a plant for the manufacturing of oxygen and hydrogen gas. Mr. W. J. Cluff is the president. Mr. A. J. MacDougall, formerly of the Toronto Power Co. designed and superintended the construction of the plant.

Chemical, Oil, and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

1919-1920.—The closing days of the year 1919 finds the Canadian chemical market healthy and strong and fairly active. Compared with the situation of one year ago, following the signing of the armistice, the trade in chemicals to-day is fully 100 % better. Manufacturers and dealers at Montreal and Toronto report business to be "good" in most lines, and in those others in which there is not a great deal of movement the prices remain firm in anticipation of an active period in all chemicals, which the trade is confidently looking forward to during the first months of the new year. While the steel and coal strikes are officially settled, yet the effect of the tying up of these two great industries is still felt by the chemical and allied concerns. Were it not for these strikes, the chemical trade in both Canada and the United States would to-day be experiencing one of its most active periods, excepting, of course, the abnormal days of the war rush. Canadian chemical dealers and manufacturers are to be congratulated on the skill and optimistic patience with which they have guided the trade during the past year. December, 1918, and January and February, 1919, were anything but encouraging months for either the dealer or manufacturer.

Benzol.—Due directly to the steel strike, the price of benzol has shot up to over 60 cents at Toronto and Montreal; toluol has also advanced, and there is a heavy demand for both.

Sodium Bichromate.—Bichromate of soda is very scarce. There is an unexplained shortage in the United States, where the price suddenly advanced from 15 to 32 cents, and at Chicago it was reported about the middle of December that some offers were made at 40 cents, but no sales were made at that figure. United States buyers have been endeavoring to purchase in Canada, but the Canadian supply is obtained from England on condition that it be consumed within the Dominion, and, therefore, this source is closed to American dealers. It is difficult to get supplies from England for Canadian consumption.

Applications for German Dyes.—The Canadian Trade Commission has announced that it is prepared to receive applications from Canadian firms requiring German dyestuffs upon which the Allied Governments have an option under the Peace Treaty. While the Allied Governments have an option on German dyestuffs and synthetic drugs of 50% of the total stock under German control, it is not intended that it should be exercised, except for such as are urgently required. Already applications have been made to the Commission by fifteen for about 30,000 pounds of these dyes. The large texture firms are, of course, the chief applicants. There is some delay in executing the applications from Canada on account of the uncertainty which exists yet as to the prices that will be asked for these dyes. The first consignment from Germany, it is understood, has been received in England. Canadian applications will be made to Britain through the Canadian Trade Commission, Ottawa.

Sulphur.—Advices from Sicily state that the Sicilian sulphur production for 1919 will be much lower than was expected owing to the frequent and prolonged strikes among the miners. The yellow Superior sulphur, which used to sell in competition with the United States sulphur, is unobtainable, and the brown, or best thirds quality, is quoted at equivalent of $51.50 per ton of 1,030 kilos, in bulk, f.o.b. Sicilian shipping points.

Pharmaceuticals.—The market in pharmaceuticals remains about stationary. Potassium bromide has advanced from $1.10 to $1.20. There is an extreme shortage of supplies of camphor, and the quotations at Toronto and Montreal for the monobromate are $5.75 per pound. Boric acid advanced during the month, 18½ cents being the prevailing rate, and borax also rose to 11¼ cents, due to the high exchange rate on United States currency.

Silver.—Silver continues to soar in price, and while the quotation of $1.36¼ per ounce of November 26th has not been maintained, the price still remains over the $1.30 mark, and on January 2nd stood at $1.32 in New York. The annual report of the Coniagas Reduction Company, issued a few weeks ago, shows that the average price received for silver sold during the year was $1.06 per ounce, as compared with 94¼ cents for the previous year, which will help to offset the decreased production for 1919 of 940,267 ounces, as compared with 974,264 ounces for 1918. The Coniagas smelter at Thorold, Ont., has been in continuous operation all year, except during the Cobalt strike, from July 23 to September 8. President R. W. Leonard, in his report, stated that continuous operation depended upon the capacity of the mill for working on low-grade ores and regrinding and retreating the sand tailings, which, under existing conditions of costs and prices, may easily be estimated to keep the mill running for three years. The Coniagas was one of the first companies in Canada in the development of Northern Ontario, and has made a reputation for reliability and a strong soundness of policy.

Gold.—While the regular rate of $20.67 per ounce for pure gold still holds, yet it is interesting to note that it is sold at the prevailing rate of American money in Canada.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

Acetanilid, C. P.	Lb.	$ .. — .70
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.04½—.05½
Acetic acid, refined	Lb.	.18½—.19½
Acetone	Lb.	.18½—.23½
Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, pure, bbl., 65% O.P.	Gal.	.. 8.25
Alcohol, methylated, bbl.	Gal.	.. 1.35
Alcohol, wood, 95%, refined, bbl.	Gal.	2.25— 2.50
Alum, Ammonia, lump and ground	100 Lbs.	.. — 5.00
Aluminium Sulphate, high grade, bags	100 Lbs.	3.25— 3.50
Ammonia, Aqua 26	Lb.	.09— .12
Ammonium Carbonate	Lb.	.. .17
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Arsenic	Lb.	.. — .09
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. 1.15
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11¼
Boric Acid, powdered	Lb.	.. —.18½
Caffeine, English	Lb.	.. — 8.50
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	26.00—30.00
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Camphor Monobromate	Lb.	.. — 5.75
Carbolic Acid, white crystals	Lb.	.. — .10
Carbon Bisulphide, in drums	100 Lb.	.22— .25
Carbon tetrachloride, drums	Lb.	.20— .24
Caustic Soda, ground, bbl.	Lb.	.05—.05½
Chalk, Precipitated	Lb.	.04¼— .06
Chloroform	Lb.	.45— .55
China Clay, imported	Per Ton	20.00—25.00
Citric Acid, domestic, crystals	Lb.	.. — 1.15
Cobalt Oxide, black	Lb.	.. — 1.65
Copper Sulphate (Blue Vitriol)	Lb.	.. —.10¾
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.00
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.40— .45
Formaldehyde	Lb.	.. — .28
Formic Acid, 75%	Lb.	.40— .42
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Glycerine, drum, C.P.	Lb.	.. — .25
Hydrofluoric Acid, 60%	Lb.	.. — .22
Hydrofluoric Acid, 30%	Lb.	.. — .11

Hydrochloric Acid, carboys, 18	100 Lbs.	2.60— 2.85
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.04¼—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	.. — .65
Mag. Sulphate, B.P., Medicinal, car lots	Ton	.. —50.00
Muriatic Acid, 18 to 20, Tanner's Standard	100 Lb.	2.00— 2.85
Naphthaline flake	Lb.	.10— .11
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Oxalic Acid	Lb.	.25— .26
Oleic Acid	Lb.	.. — .23
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.10
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.22— .24
Potassium Permanganate, bulk	Lb.	.75— .85
Phenacetin	Lb.	3.10— 3.25
Quinine	Oz.	1.02— 1.50
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Saccharin	Lb.	.. — 5.50
Salicylic Acid	Lb.	.75— .90
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.02 3-5—.02 4-5
Sodium Acetate	Lb.	.14— .16
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Cyanide, 35-37%, in car lots, per lb. of contained Sodium Cyanide	Lb.	.. — .44 .. — 7½
Sodium Nitrate, refined	100 Lbs.	6.75— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.19— .20
Sodium Nitrite	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.25— 4.75
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.70
	Per Cwt. in Car Lots	.. — 1.60
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .42
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 2.75
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Sodium Bisulphite, 35	Lb.	.. —.02½
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tannic Acid, commercial	Lb.	.75— .85
Tartaric Acid, crystals or powdered	Lb.	.75— .80
Tin Chloride, crystals	Lb.	.47— .50
Ultramarine, Blue	Lb.	.18— .45
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
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Zinc Sulphate, com.	Lb.	.05½— .06
Zinc Dust	Lb.	.13—.14½

Metals.

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Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. —.24½
Copper, electrolytic, in car lots	100 Lb.	.. — .24
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.09¾
Lead, in car lots	Lb.	.. —.09½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.40— .45
Platinum, pure	Oz.	155.00—160.00
Silver, bar	Per Troy Oz.	.. — 1.32
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .65
Zinc, sheets	Lb.	.09¾— .10

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Motor Gasoline (service stations)	Gal.	.. — .35
Lighting Gasoline	Gal.	.. — .37
Naphtha	Gal.	.. — .31
Coal Oil	Gal.	.. —.21½
Fuel Oil	Gal.	.. —.09½
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 2.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 4.75
Crude Creosote Oil	Bbl.	16.00—18.00
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Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .18
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Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	2.33— 2.43
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Indian, No. 1	Lb.	.. — .42
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Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
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Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
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Arabic, powdered, No. 2	Lb.	.. — .39

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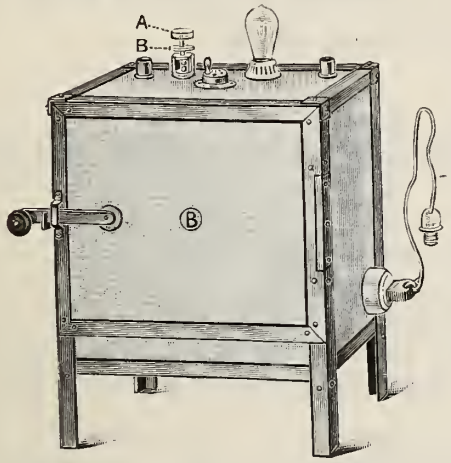

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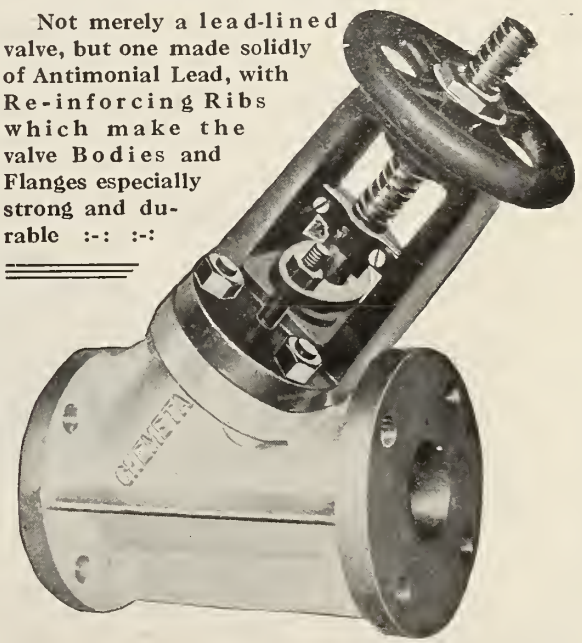

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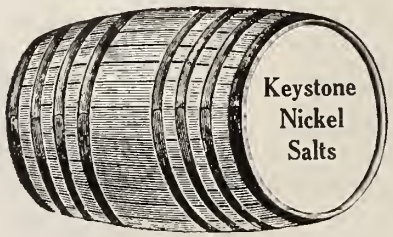

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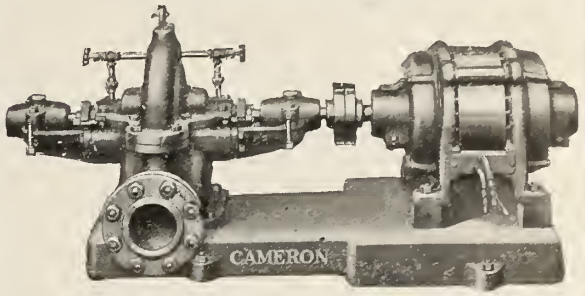

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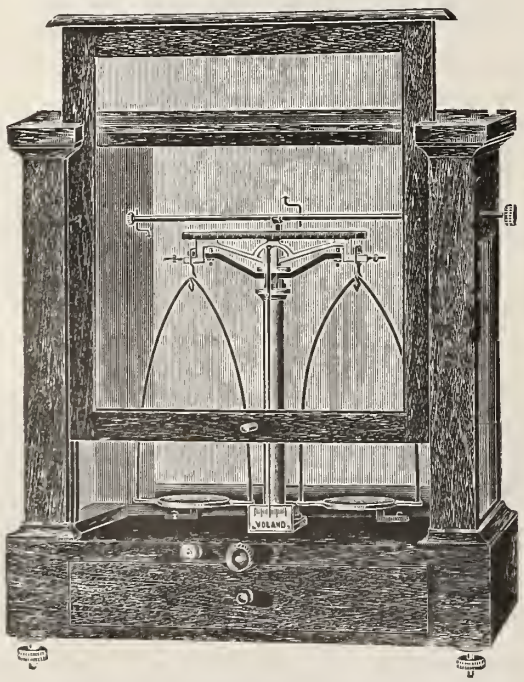

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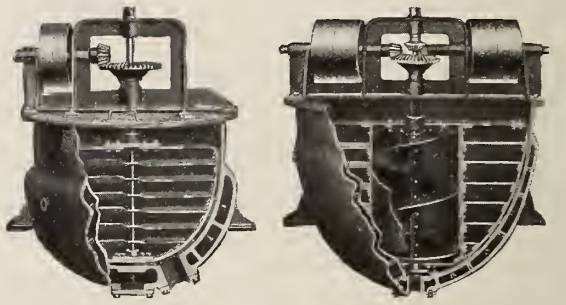

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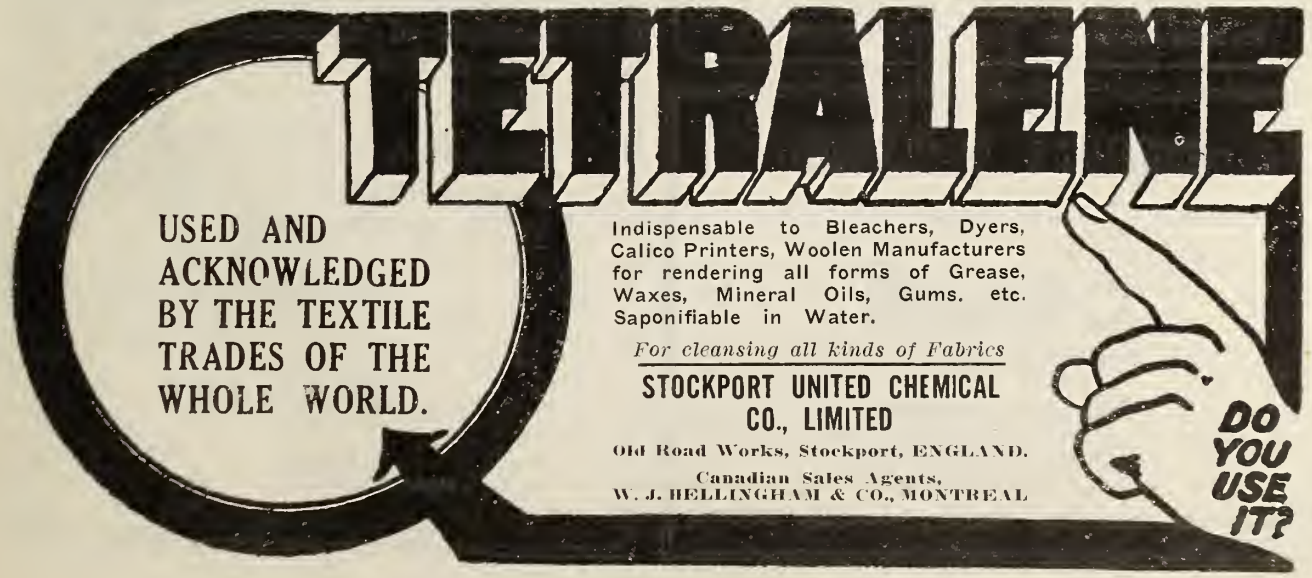
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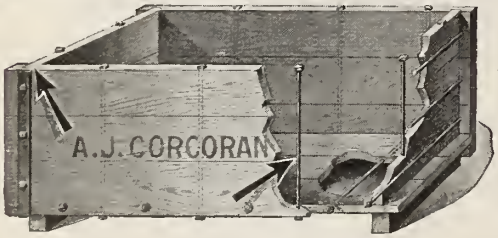

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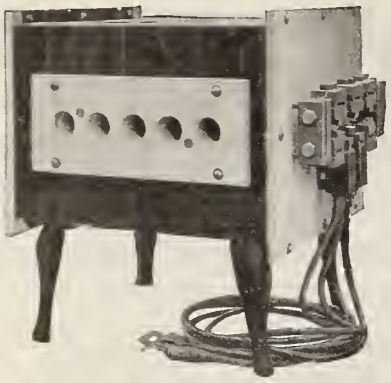

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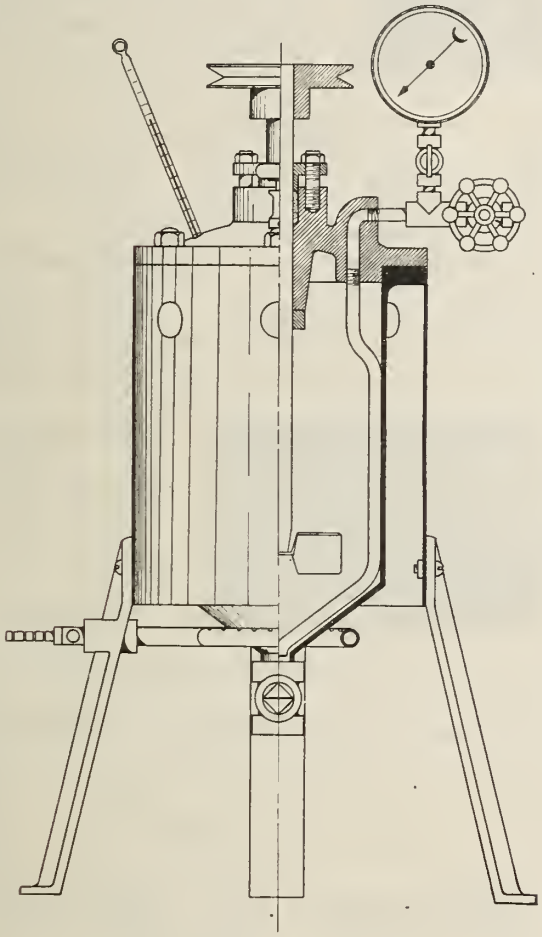

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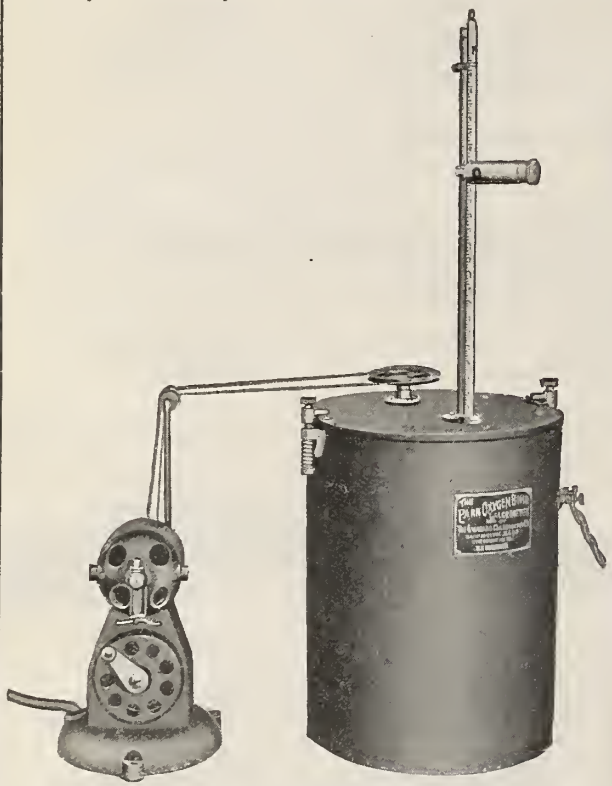

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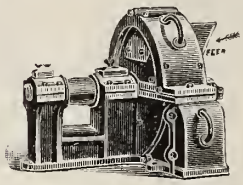

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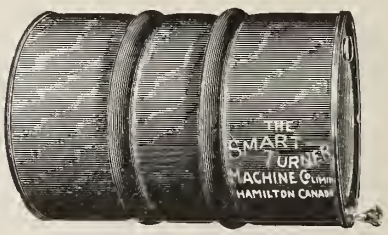

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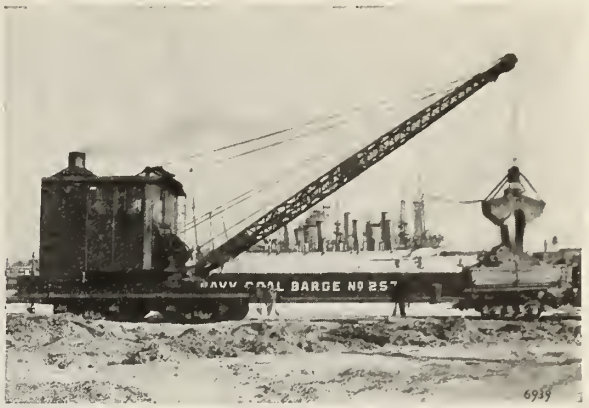

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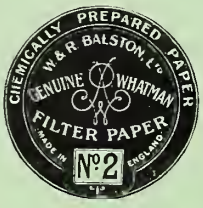

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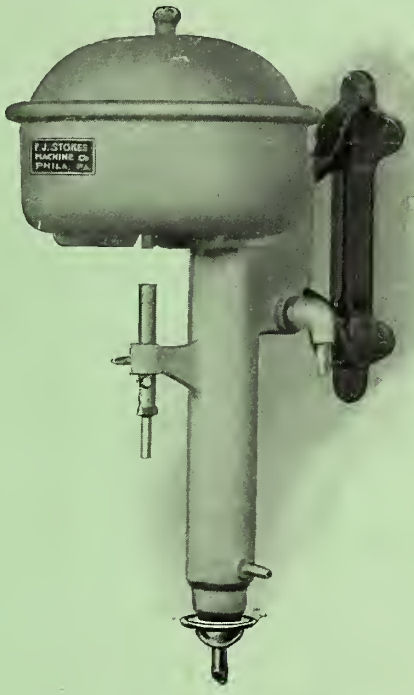

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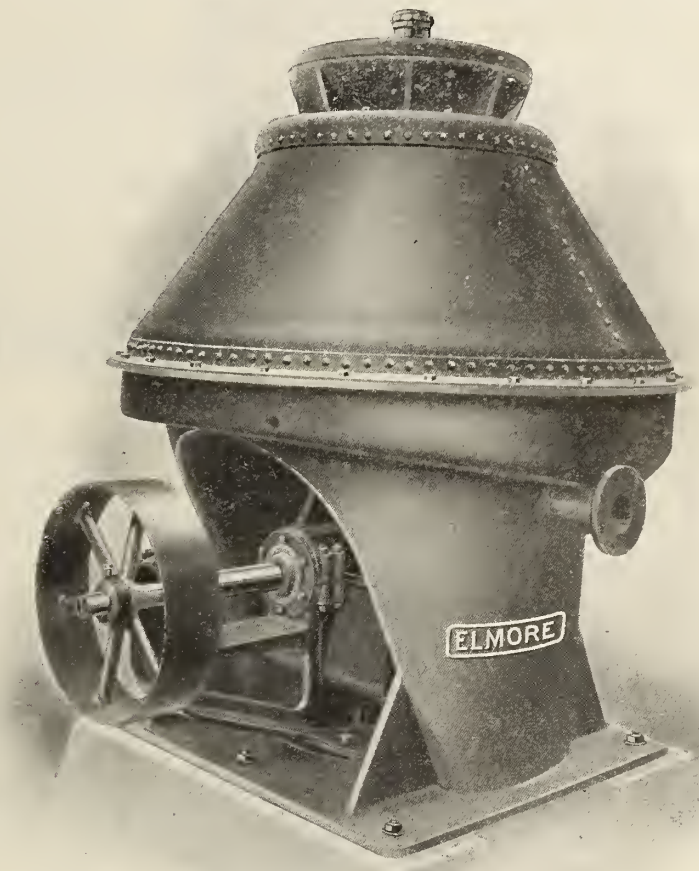

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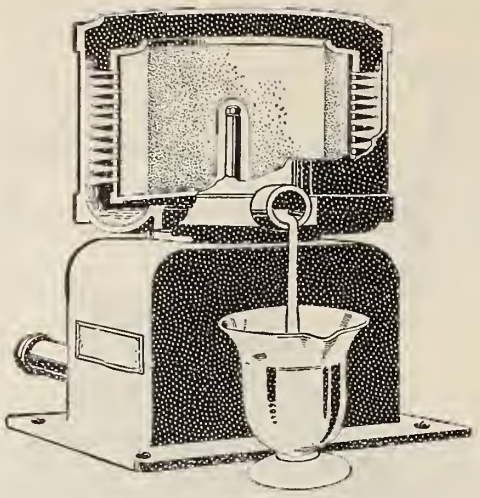

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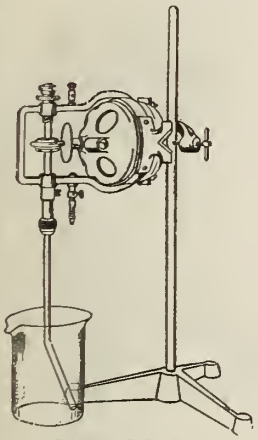

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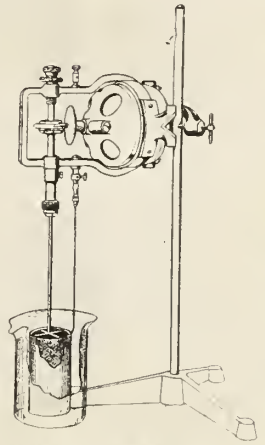

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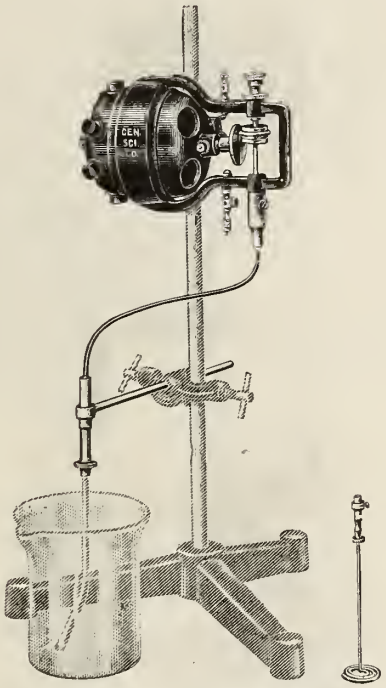

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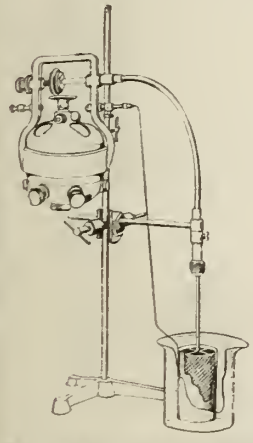

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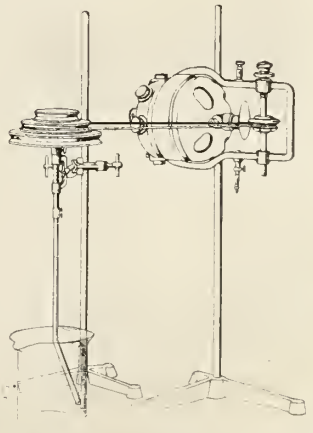

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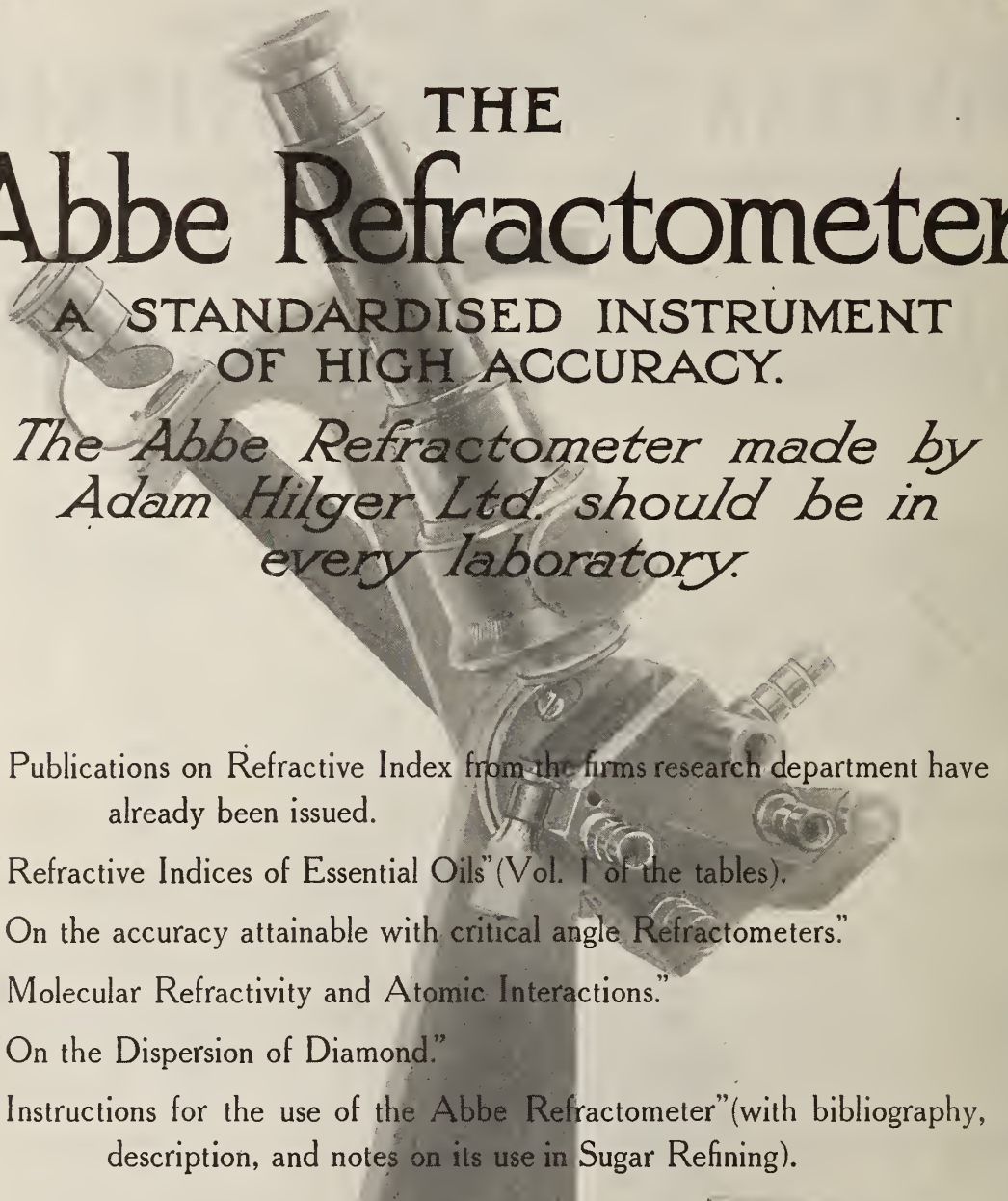

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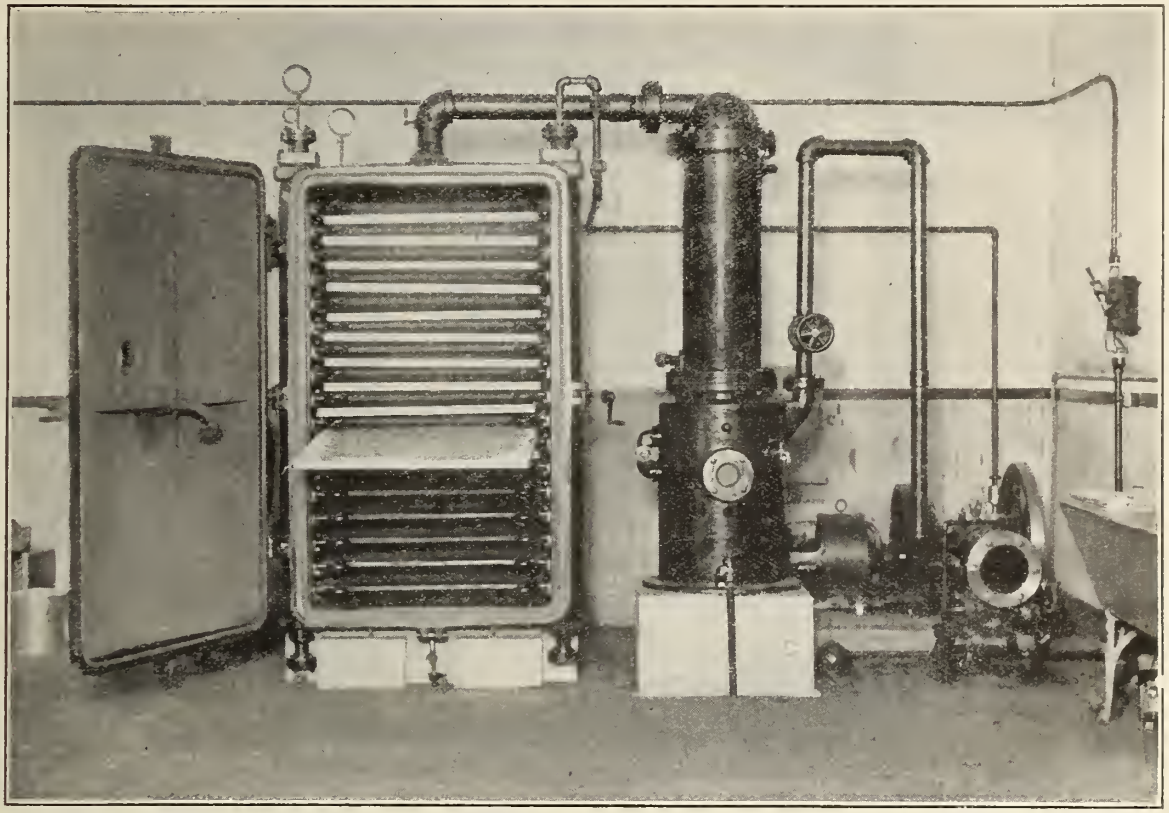

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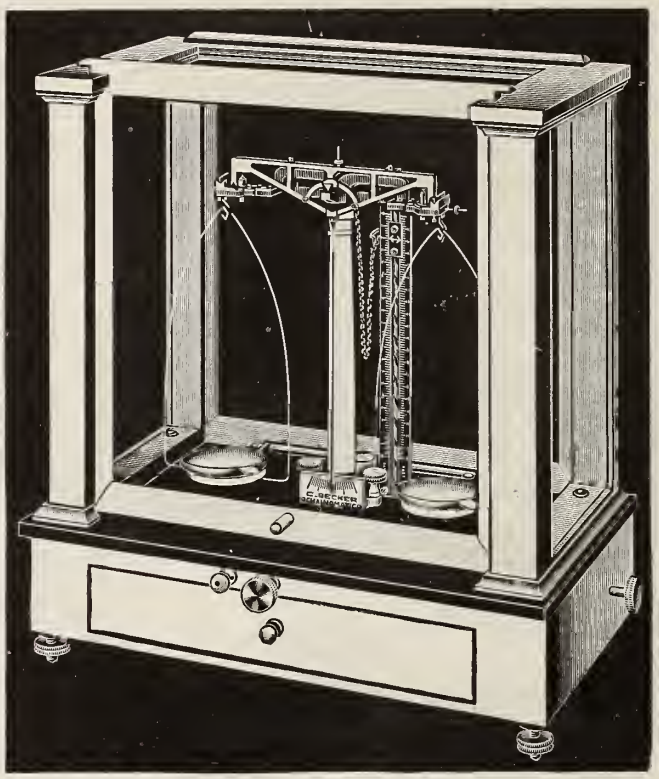

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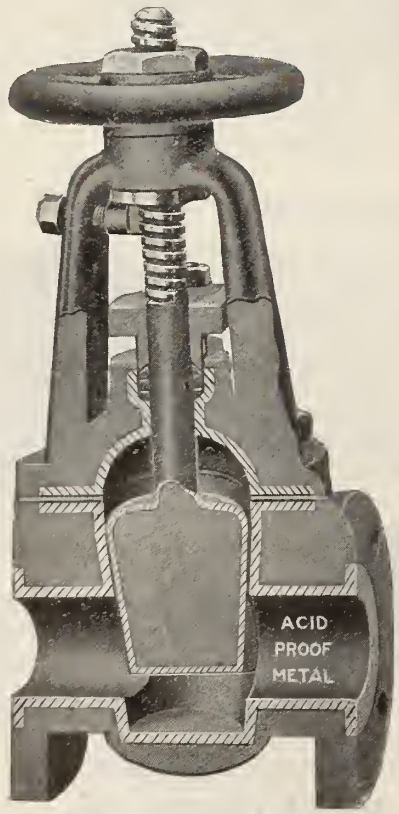

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EDITORIALS

OUR GREATEST SCIENTIFIC OPPORTUNITY—WOOD HYDROLYSIS.

WITH the food problem throughout the world so acute that famine prices prevail, and with our gasoline supply rapidly being exhausted, can we much longer refuse to consider wood waste and other cellulosic materials as a source of relief for these conditions? Has the time not come when adequate steps must be taken to prove or disprove the claim that in these forms of material we have a possible solution for both these problems? Sir William Crookes predicted that the two greatest chemical achievements of the present century in relation to the welfare of mankind would be the fixation of atmospheric nitrogen and the conversion of cellulose into sugar and alcohol, and it seems likely that this prediction will be sustained.

Cellulose and starch have the same chemical composition, and it has been pretty well demonstrated by the work of Classen, Tomlinson and others that at least a goodly percentage of cellulose, like starch, can be commercially converted into sugar, and in this way cellulosic waste made to replace or supplement starchy foods for certain purposes.

Cellulose is the most prolific product of nature, and of this there can never be a shortage, since it is continually reproduced in almost inconceivable quantities and most of this ultimately goes to waste. For example, it is estimated that 20,000,000,000 lbs. of wood is wasted in Canada in connection with the timber industry alone, and in addition to this the amount of straw and other forms of cellulosic waste must be many times greater.

It is impossible to predict what might be accomplished in this field if sufficient properly directed research was applied, but even on the basis of yields which have been commercially demonstrated, our wood waste is apparently sufficient to produce 2,500,000,000 lbs of sugar. That this sugar, if produced, might be the equivalent of any equal weight of grain for making alcohol or even for feeding stock, looks reasonable. If we were destroying or wasting 40 or 50 million bushels of grain every year it would arouse national consternation, and yet this seems to be just about what we are doing in this case, without a thought as to the economic loss involved.

Future developments may even show that this amount of wood waste is equivalent to our annual production of wheat in potential value, should its theoretical conversion into sugar be accomplished.

In view of these facts and possibilities, does it not look as if the problem of wood hydrolysis, as its conversion into sugar is termed, represents the biggest fundamental proposition in the whole field of industrial research?

Canada, with its huge undeveloped area, produces cellulose in almost indefinite quantity. We are, therefore, in an extremely favorable position to take the lead and gain the commercial and economic advantages which its use along these lines must bring, just as we are now doing in the case of pulp and paper.

The problems thus suggested and the possible results obtainable seem of such national and economic significance that it becomes a matter which should not be left entirely to private enterprise, but deserves to be taken properly in hand by the governmnt and something commensurate with its present importance accomplished.

It is a remarkable thing that it still remains so difficult to impress non-technical government officials with a matter of this kind. Those who have been concerned with the industrial problems of our Forestry Department have been working to date under such a handicap that it has been difficult for them to impress the value of the work they might be doing upon higher officials. We need at Ottawa a strong group of technical men, who are not mere servants in the house of the government. The day has gone when national resources may be obliterated without some effort at replacement or full development. It would not then be out of order for either the Dominion Government alone, or working in conjunction with those provinces where the matter is of special importance, to undertake to demonstrate in a practical way that our great present wastage in wood might be profitably stopped. What clogs such action is a lack of conception and vision on the part of lumbermen, paper makers and the government. This development is of national importance and should be undertaken as a national measure in the interests of the public generally. Some day it will be done, but the time for action is past now, and every hour the waste goes on. Let us not only hand down to future generations a noble heritage of principles, but also a few things well done when they should have been done.

STEEL AND METALLURGICAL SITUATION.

IF it is possible for an individual to accurately gauge anything at the present moment it would seem that the supply of steel was not equal to the demand. Price in America is quite secondary to the ability to supply, and yet, while this may be true for steel, the situation is by no means as simple as it looks, and there are a number of opinions which obtain publicity, which, while they are not decidedly misleading, are narrow.

When it is considered that on the arrival of peace, contracts were called for the erection of bridges in France and Belgium, it came as a rather amazing thing that German contractors should be in a position to place a structure completely ready to use for an amount about equal to the cost of the raw materials in England. An entirely new conception of things is obtained when the correspondence which passed between the French Government and our trade authorities is taken as evidence. In our first efforts to look for markets for ferro-alloys, our wireless messages were picked up by France, and it was immediately evident that in some ferro-alloys France could nicely afford to place finished products in New York or Montreal for a sum which not only tended to shut off competition, but utterly obliterated our new war-time ferro-alloy industries.

In some instances these plants are being modified, and are going ahead in lines which have a better opportunity under the new conditions. The United States has been taking the attitude that everything must be protected from dyes to paper mills. The completely self-contained idea cannot be worked out internationally. Without for a moment casting aside the absolute necessity for key industries, there must be some give and take. All the industries in the world cannot be protected and cultivated in any one country without some regard to source of raw materials. Our present situation is aggravated extremely by international exchange rates, and this, along with the desire of every nation to set up a high protective tariff on the things they are not able to produce in great quantity cheaply, or articles they think they could produce if they were protected, is bound to bring strong pressure on such a country as Canada.

Peace struck the United States steel industries a tremendous blow. Labor not working to capacity of plants reduced the output to 1915 dimensions, and yet during the last six months the price of pig iron has been going up in a manner which we now consider as perfectly natural. No labor, no coal, has not produced steel in the face of a capacity at least 40 per cent. greater than that of 1914, and a new necessity that hardly knows a limit. If international chaos will but clear away, 1920 should show large production.

The peculiar Canadian situation has been regularly dealt with at length, and a variety of forecasts have been made at one time and another. We are in a position where we may be able to make accessories to the iron and steel and metallurgical industries, but are not likely to get close to the middle of the stream. Unless tariffs shut us out completely we seem to have some advantages when the production of any special steel or alloy is considered, more particularly if the operation involves electric power and can be carried on in the electric furnace. There is a Dominion consumption that will certainly grow, and it is along these lines that that those who consider iron and steel industries in Canada must advance, with the possible exception of the Nova Scotia companies.

The aim, then, would seem to be to produce steel in Canada up to the limit of consumption, if in any way possible, at the same time developing our own or imported ore along special lines.

CONVENTION FORECASTS.

IT is now practically decided that the 27th and 28th of May will see as large a gathering of the chemists of Canada at Toronto as has ever been recorded. Whether or not people come because of their connection with the Society of Chemical Industry, the Canadian Institute of Chemistry and other Canadian chemical societies, or their general interest in the progress of applied chemistry, and business, it is certain that, taken as a whole, they will represent the chemists of the Dominion, and from a very important angle, practically all of our industries.

The greatest thing that a convention is likely to do for any individual is to raise his respect for the importance of his labors, increase his perspective, and send him away with a larger potential, that will sustain him in his work with his associates. A convention allows for that momentary personal contact which moulds and smooths out local viewpoints, consolidates thought in national channels, gathers up the threads of individuality into a powerful cable by which contact may be sustained with national affairs and over which messages of force may be directed in the general interests of Canadian progress.

Conventions of chemists in Canada are still new, and, therefore, it is only to be expected that matters of further organization will be brought up. There is also the general matter of the definite utilization of Canadian resources. Never before has there been such an interest shown by manufacturers in many of the chemical products that might be produced here but never have been. The Federal Government

needs the healthy advice of chemists, and it is possible that we are close to the time when our Ottawa representatives and industrial leaders in general might listen in a new way to well-thought-out balanced proposals, along lines intended to develop and save our national resources.

Each convention is a new opportunity for the chemist to step up and show who he is. Nearly everyone has had that national opportunity already, and many of the winded leaders from the ranks of so-called capital and labor, pseudo developers of national wealth, are about ready for "the new method." Let the chemist help to show that it is applied brains and labor, with any reasonable sort of peaceful government, that will solve pressing difficulties of industrial life and greatly assist in ushering in national happiness and prosperity.

As we said before, there is certain to be a notable gathering of the greatest personal value and importance to you.

TENURE OF UNIVERSITY PROFESSORS.

THE vexed question of the rights of the professors recently dismissed from the University of Saskatchewan is certainly receiving more than provincial recognition, and is becoming a national and international matter of vital importance to the teaching profession generally. A League of Citizens is very rightly asking for a full investigation by the Saskatchewan Government, for the very good reason that nothing short of this seems likely to move the Board of Governors of the University to act beyond their present legal right to do as they choose without giving any logical summary or specific announcement of their reasons. The Board of Governors, as a body of responsible and able men, should not hesitate to clear this matter up by a public statement of the reasons they deemed sufficient for their action. By waiting until such a statement is forced, their position is very much weakened, and teachers everywhere, as well as the public generally, are very likely to take the attitude that when viewing the whole matter in retrospect, the Board has about decided that their action was, to say the very least, a bit hasty, if not rash. No matter what comes of it, the Board of Governors cannot claim that their action was either democratic or astute. Eventually it will become their move, and it might be that the usual amount of pettishness and personal nonsense that is generally basic to such affairs will be disclosed.

In looking for parallel cases, it is difficult to find any which even approximate the situation existing in Saskatchewan. The influence of a Provincial University is something that is not often measured by the public, but when it is taken into consideration it is found that such an institution is one of the great base lines for national development. If this is rudely disturbed, a whole avalanche of secondary reactions follow.

These are the reasons why, on the one hand, the Saskatchewan Government must follow this case through to some definite result, even if high heads are bumped; remembering, at the same time, that the matter is of general interest to all professional teachers who, in one way or another, are bringing themselves and their work to the front as never before.

The history of the evolution of all our social systems is full of test cases of great importance, and upon these present opinions and laws are based. In every instance autocratic power used unwisely has been destroyed. University professors in all ages have been dealt with by State authorities in a way peculiar to their essential work, and therefore it is highly advisable that no product of apparent modern genius, such as the so-called efficiency expert, be allowed to convince us that for such a purpose artificial flowers or decorations are equivalent to the unfolded perfection of living mind and character, capable of being produced and generally inherent in the type of man who attains the leadership of a University department.

WATER SUPPLY.

AN energetic temperance speaker recently stated that pure drinking water made prohibition in America possible. The beer drinking of Germany, the wine drinking of France, the ale drinking of England may be the outcome of an effort to avoid the drinking of impure water supplied for domestic use. In America we have such an abundance of pure water for drinking purposes that we never became a beer-drinking people. But will this day continue?

The ancients, and even the Indians, considered the rivers and streams of their countries in a personal and sacred manner. There were "River Gods" in those days. Now, towns and villages have developed upon our once pure sparkling streams. They dump their waste and filth until these same once-pure streams become little better than sewers; a most uninviting and dangerous source of water supply. It is true the chemist and engineer have devised many methods of purification, but it is an unequal fight—the filth of many against the skill of the few—and sooner or later (unless there is a change) our once pure streams will be of the past.

Canadians are not yet taking full advantage of their great inheritance. They do not realize the importance of preventing unnecessary contamination of the sources of their water supplies. It would be far more sensible to maintain a pure source of supply

than to attempt purification, no matter how scientific. And yet, how many municipalities are content to treat an impure water, trying to make it safe, rather than spend a little more and go to a pure source for their supply.

Innocence rather than repentance should be our guide with reference to water supply.

CANADIAN coal owners in Alberta are having no easy time establishing themselves in Winnipeg. The Alberta Coal Industry Commission, on looking into the matter, find that the handling of American coal has been so established, and is working so smoothly, that nothing short of an educational campaign , along with new facilities for the Canadian coal, will allow the use of Alberta fuel. Poor shipping facilities, and a general uncertainty of supply, hinders the trade.

We hope these difficulties will be removed, because, in a general way, it is a pure absurdity for Canada to import American coal into the Western Provinces.

THE WATERS OF LAKE MUSKIKI.

By FRANK T. SHUTT.

IN a recent issue* of this journal there appeared an interesting article on Muskiki Lake, Saskatchewan, and on the methods employed at the lake and in the refining plant at Kitchener, Ontario, in preparing various salts from the lake water and its underlying saline deposits.

It will, no doubt, prove a useful supplement to this descriptive account of an apparently valuable natural resource to publish the analyses of the waters of Lake Muskiki and its chief contributory springs, made in 1915 in the laboratories of the Chemical Division, Dominion Experimental Farm, Ottawa.

This work was undertaken at the instance and request of the Irrigation Branch, Department of the Interior, Ottawa, which had received an application from certain parties for permission to "extract minerals, chiefly potash" from a lake (Muskiki) in Townships 38 and 39, Ranges 26 and 27, west of the 2nd Meridian. Before considering the granting of any right to utilize the waters of the lake in the manner proposed, the departmental officers were naturally anxious to learn the nature and concentration of the compounds contained therein and accordingly submitted the water samples to these laboratories, in which, for some years, the chemical and physical examinations necessary for the classification of soils in irrigated districts in the Northwest by the Department of the Interior had been made.

The inspection of the lake and the mineral deposits on its shores and the collection of samples for analysis were made in November, 1914, by an engineer of the Department of the Interior who, reporting, in summary, by telegraph, to the Commissioner of Irrigation, stated: "Muskiki Lake has no value as a water supply. Mineral salts in water and deposits of salts in places round shore. Depth of water, one foot to four feet. Shores muddy and in places ingredients prevent mud freezing. Lake 100 feet below general level of the country; drainage impracticable. Largest spring is in bed of lake near east shore; it is strongly saline and bubbles up above water level. Some fresh water springs on bank. Talk of sanitorium here for rheumatic complaints. Local opinion apathetic towards destruction of lake. Recommend it if necessary for utilizing salts, but make provision for medicinal baths if possible. Samples to follow."

Four samples of water were received and analyzed, the chief object of the investigation being to ascertain the value of the lake water as source of potash. The particulars are as follows:

No. 1 (Laboratory No. 19757)—From main spring in lake (near shore).

No. 2 (Laboratory No. 19758)—From another large spring in lake.

No. 3 (Laboratory No. 19759)—From a third spring in lake, farthest from the shore.

No. 4 (Laboratory No. 19760)—General sample of lake water.

Results of Analysis.

Results expressed in grams per 100 c.c.

	No. 1 (Laboratory No. 19757)	No. 2 (Laboratory No. 19758)	No. 3 (Laboratory No. 19759)	No. 4 (Laboratory No. 19760)
Specific gravity at 18° C.	1.12	1.1215	1.1215	1.190
Total solids at 105° C.	17.0472	17.0886	16.9472	27.661
Solids after ignition	12.4492	12.2961	12.5962	20.981
Loss on ignition	4.598	4.7925	4.351	6.680
Lime (CaO)	Absent, or traces only			
Magnesia (MgO)	4.036	3.990	4.025	6.351
Potash (K_2O)	.1574	.1495	.1525	.2918
Soda (Na_2O)	1.113	1.048	1.016	1.760
Silica (SiO_2)	.007	——	.008	.008
Sulphuric acid (SO_3)	7.190	7.21	7.712	11.66
Chlorine (Cl)	1.879	1.836	1.79	3.58
Carbonic acid (CO_2)	.1018	.095	.0841	.1139

These data very clearly indicate that the saline matter of these waters consists essentially of the sulphate and chloride of the bases magnesia and soda, sulphate of magnesium predominating.

The potash content, while not insignificant for a saline or mineral water, would not appear to be such as to warrant, under ordinary conditions, its extraction. Thus, expressing the results for potash in gallons (Imperial) and pounds, we obtain the following:

Potash Content of Waters.

No. 1—63.53 gallons contain 1 pound potash
No. 2—66.88 gallons contain 1 pound potash
No. 3—65.49 gallons contain 1 pound potash
No. 4—34.27 gallons contain 1 pound potash

The three samples of spring water (Nos. 1, 2 and 3) show a remarkable similarity; these waters may be considered as practically identical in respect to their saline content, both as to its composition and concentration.

The lake water (No. 4) possesses a much higher salinity than the spring waters, concentration due to evaporation evidently having taken place. It is of interest to note that the percentage composition of the saline matter of this lake water is similar to—indeed, almost identical with—that of the spring waters, proving that the springs constitute very largely the source and supply of the lake.

Laboratories, Division of Chemistry,
Dominion Experimental Farm,
Ottawa, January 23, 1920.

*Natural Sources of Magnesium, Sodium and Potassium Salts, located at Dana, Saskatchewan; by C. W. Hancock. The Canadian Chemical Journal, December, 1919, pp. 399-401.

COLLOIDAL FUEL*

The Nature of Colloidal Fuel, Its Development During the War, Results by Trials, with a Review of Its Present and Future General Industrial Possibilities

By LINDON W. BATES

COLLOIDAL FUEL is a combination of liquid hydrocarbon with pulverized carbonaceous substance, the components so combined and so treated as to form a stable fuel capable of being atomized and burned in a furnace. It is made in three forms, a liquid, a gel and a mobile paste. The new composite is intended primarily to be used as fuel. While the designation "Colloidal" is given it because so much of the combination is in the colloidal state, the name is not scientifically adequate, since much of the solid component is not reduced to colloidal dimensions. The title is, however, descriptive because of the important colloid-like characteristics of the composite. It is linked up to the ratios of oil sixty per cent and coal forty per cent, or thereabouts. It is a mobile paste up to the ratio of oil twenty-five per cent and coal seventy-five per cent. All kinds of oils and solid carbons may be used. The cheap coal breakages and wastes are all available. The liquid is used in the self-same way as oil fuel and with the same apparatus. The coal particles are maintained in a state of suspension in the oil during the time required for the use of the fuel—days, weeks or months.

In marine tests on the U. S. S. "Gem," equipped with Normand express boilers, Colloidal Fuel showed evaporative efficiency which reached 91.5% on a short run, while that of the Navy Oil did not on any run exceed 79.4%, and that of pulverized coal 72.6%. In general, Colloidal Fuel is on a parity with oil, while certain grades are superior. For example, on land boiler eight-hour tests made under certain return tubular boilers, Colloidal Fuel Grade 13 gave 76.8%, and Grade 14 gave 85.3% combined boiler and furnace efficiency from and at 212° F, both being compared with Mexican Reduced Oil, which on the same boilers gave 73.3% to 79.46%.

Special Qualities of Colloidal Fuel.

Colloidal Fuel enjoys several special qualities. The calorific value per unit volume is greater than that of straight oil unless coals of very low heat value and specific gravity are incorporated. The reason is that coal is much heavier than oil, though of less calorific content, so that the coal content actually frequently raises the calorific value. The addition of coal is not an adulteration of the oil, but an enrichment. Thus in a composite made up of 35% by weight of pulverized anthracite coal of 14,000 B.T.U. per pound and 1.6 specific gravity and 65% oil of 18,200 B.T.U. per pound and .96 gravity, a gallon of the composite has 165,000 B.T.U., while oil has 146,000 B.T.U. per gallon.

Owing to its coal content, Colloidal Fuel is heavier than water, while oil is lighter, and the character of the composite is such that it may be stored under a water seal and its fire may be quenched with water. The water forms a layer over the liquid combustible. The feature is of vast importance since an oil fire cannot be extinguished with water, and hence the rules governing its use are justifiably drastic. Not less than 6.4% of all fires are caused by "Fuel Oil," according to the National Fire Prevention Association.[1]

Opinions of Fire Protection Associations.

The Board of Standards and Appeals of New York City, of which Hon. John P. Leo is Chairman, adopted a set of rules which went into effect December 1st, 1919, to admit liquid fuel into the city. Rule 1 contains the following provision:

> "The term 'oil for fuel purposes' under these rules includes any liquid or mobile mixture, substance or compound derived from or including petroleum."

The rule is phrases so as to admit Colloidal Fuel, which is a liquid or mobile mixture including petroleum. Colloidal Fuel is also an exceptionally favorable situation under the Tentative Regulations of the National Fire Protection Assocition, adopted on November 3rd, 1919. These set the standard in Canada and in the United States. "Oil burning equipments are those using liquids having a flash point above 150 degrees F. closed cup tester." The word "liquids" was selected so a sto include the new fuel. Section 1, Paragraph (a) provides: "For liquids of 20 degrees Baumé and below, tanks may be of concrete," and section 4, Paragraph 34, states "Where it is necessary to heat oil in storage tanks in order to handle it, the oil shall not be heated to a temperature higher than 40 degrees F. below the flash point, closed cup." This excludes several varieties of fuel oils which require preheating over or close to their flash point in order to flow. This is not the case in the Colloidal Fuel. The Laboratory of the National Board of Fire Underwriters has certified that Grade 13 of the new fuel had a flash point of 266 degrees F. and Grade 15 had 273.20 degrees F. Grades 13 and 14 were preheated in practice to about 130 degrees F. The apparent ignition temperature was 779 degrees F. and 788 degrees F. respectively, while neither gave off volatiles at room temperature or 40 degrees C., nor gave evidnce of spontaneous heating. It is for these reasons that Colloidal Fuel enjoys unusual safety features.

Development of Colloidal Fuel Idea.

The combining of pulverized coal with oil and of tar with oil to make a liquid fuel has had devotees. As, however, oil does not ordinarily dissolve coal or tar, the problem was how to overcome the comparatively rapid and uncontrollable separation or settling out or sedimentation of some of the components. The present success was born immediately of the war efforts and was conceived to meet the shortage of fuel in the Allied Navies. It is a highly scientific chemical development and its importance to industry cannot be overstated.

The superiority of atomizable over solid fuel has long been recognized and proven. The advantages are both in conservation and operation. Further, the cost and scarcity of refinable oils has set metes and bounds for their employment. Several causes have made desirable the evolution of a process for combining the cheaper or more plentiful sources of carbon with the liquid hydrocarbons. The former are generally solids such as coal and lignites or tars or pitches. The science of Chemistry has at last in Colloidal Fuel disclosed an adequate creation. It gives

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* Paper delivered before Ottawa Branch Canadian Section Society of Chemical Industry, Ottawa, December 12, 1919.

[1] "Handbook of Fire Protection," Crosby-Fiske-Forster. 6th Edition, 1919, page 69.

a satisfactory, easy and cheap treatment, whereby gravitation is superseded in control and the desired fuel is secured. A new range or series of fuels has been developed each with the characteristics of its special "blend."

Nomenclature of Colloids.

The chemistry of colloids is comparatively new, but a whole world there awits development. Three states are now defined in the dispersion of combined substances, whether the composite be in the solid, gaseous or liquid form. These states are solution, colloid and suspension. While possessing each its distinctive qualities, they yet merge on the borderland into each other. Nature does not establish artificially limits for the states—the boundaries are man defined but are now generally accepted. The so-called "molecular" solutions, the colloids and the "coarse" or "mechanical" suspensions are of recognized delimitations. True solutions are those whose particles or droplets of the disperse phase in the medium are of a dimension less than 1 $\mu\mu$.—i.e., have a diameter less than .000,000,1 c.m. In colloids the dispersed particles or droplets are between .1 μ. and 1 $\mu\mu$. in diameter—that is, they are less than one hundred-thousandth, but greater than one ten-millionth centimeter in size. In suspensions the size (or diameter) of particles or droplets is larger than one hundred-thousandth of a centimeter, or 1 μ[2]. Emulsions and suspensions are to be differentiated. In emulsions the droplets are liquid and are above colloidal limits. They move in a liquid medium with which they do not mix. In suspensions solid particles also above colloidal limits move in a liquid medium. Emulsoids are emulsion components in a colloidal state while suspensoids are suspension components in a colloid state[3].

Between the suspension and the colloid states are certain definite distinctions. For instance, in a suspension, particles .001 c.m. in diameter just reveal Brownian movement. In a colloid the particles reveal rapid Brownian activity. Again, colloids can be filtered through the finest filter paper without appreciable loss of particles. In a suspension the particles are held by the filter paper. Under the best microscopes magnifying 2,250 times, particles 15 μ. in diameter become just visible. Larger particles may be measured. Smaller particles, those within colloidal limits, are not measurable and are barely detectable under an ultra microscope.

Solutions have a distinctive quality which is that in them dispersed particles do not settle to the bottom or rise to the top or under normal conditions separate. If the particles are sufficiently within the upper limits, the same will be a fact of the colloid state. As a natural characteristic, colloids have relative or nearly absolute stability, but of course by treatment the particles may in many cases be precipitated. This is true also of solutions. In suspensions, weight is an important element. It affects the deposit of particles as small as 50 $\mu\mu$. or one-tenth of the length of a light wave. Hydrosols in which the particles are less than 20 $\mu\mu$. in diameter remain clear and do not settle at all. Particles of 10 $\mu\mu$. diameter and 3.0 specific gravity settle in water a distance of only 1 m.m. a month. For gold hydrosols, with particles 20 $\mu\mu$. in size, the time of settling is calculated at 1 m.m. in seven hours.

In suspensions, weight and size of particles are important qualities. The tendency to precipitate to the bottom may be reversed for a movement of floating to the top. For instance, globules of caoutchouc from .5 μ. to 2.5 μ. are found in Hevea latex, but in latex of Funtumia few particles have a diameter as great as .1μ. Fat particles in milk are found through the wide range of from .1 μ. to 22.2 μ. Zsigmondy[4] reports that the study of coarse suspensions "reveals little save sedimentation." "Stability" and "suspension" as applied to the state of matter are not synonymous.

The Quality of Stability.

It has been stated that an atomizable fuel has very many advantages over one not atomizable. To secure this advantage, the components should be capable of simultaneous combustion. This necessitates mobility of the fuel and that its components shall be sufficiently stabilized to insure the fuel's passage through the pipes, preheater and other parts of the apparatus without congesting. Stability to this end manifestly may be variable in duration and degree. If the fuel is to be consumed at once after treatment, a short duration of stability may be adequate. If the fuel is to be stored, self evidently the stability must endure for the period of storage, be that days or months. The stability must also withstand certain changes in temperature, such as the preheat. To equip the composite with just the right stability is a fine art, calling for judgment and experience, since the particles must be kept from both precipitation and flotation for a determined interval. Several variable elements enter into the treatment and the character of the burning, conveying and atomizing systems must be also allowed for. In referring herein to "stability," adequate stability is claimed—stability sufficing as the case may be for quick use or for storage through months of time. This is a matter of regulation and control (within reasonable limits) of movements within the composite. To appreciate the extent and intent of this control of stability, how it is exercised and how obtained it is necessary to study the laws governing the motions of dispersed particles in a liquid medium.

Laws Governing Stability.

Stokes' Law for the terminal velocity of a spherical body falling in a liquid gives a formula from which discussion may proceed. Under a constant force such as gravity the velocity is expressed by the equation

$$V = \frac{2r^2 (s-s') g.}{9 v}$$

In this formula g is the constant of acceleration per unit mass, i.e., gravity; r is the radius of the sphere; s is the specific gravity of the sphere; s' that of the liquid; v is absolute viscosity coefficient of the liquid. It is self-evident that the difference (s—s') may be positive, zero or negative; the particle may fall or rise or remain stationary, depending upon whether its specific gravity be greater, less or just that of the liquid. The velocity whatever the direction, will be inversely proportional to the liquid's viscosity and proportional to the square of the radius[5].

With the equation cited, having the equivalents for the several terms, one can figure for instance the theoretical rate of precipitation for pulverized coal in oil. Taking pulverized anthracite coal dispersed in a heavy crude oil

[2] Burton, "The Physical Properties of Colloidal Solutions," 1916, page 10.

[3] Taylor, "The Chemistry of Colloids," 1916, pages 6, 18.

[4] "The Chemistry of Colloids," 1917, p. 22.

[5] Hatschek, "Introduction to the Physics and Chemistry of Colloids," 1916, pages 23, 24.

heated several times to between 200 degrees C and 300 degrees C to remove most of the volatile constituents, the numerical expression at 20 degrees C works out as follows: g=981 c.m. (32.181'); s=1.467; s'=.9 and v=6.7 to 7.0. The radius of the coal particle may be sufficiently accurately taken as one quarter of the reciprocal of the mesh number of the screen through which the pulverized coal passes. The size of the maximum particles which pass a 50 mesh screen is taken as .0254 c.m. in diameter. The size of the largest particles passing 100, 200 and 400 mesh screens is estimated as about .0127 c.m., .00634 c.m. and .00316 c.m. respectively. Particles of these dimensions are much above colloidal sizes, whose upper limit is .000,01 c.m. In accordance with these calculations coal so pulverized as to pass through a 50 mesh screen would settle 244.189 c.m. (96.137") a day. To meshes of 100, 200 and 400 respectively correspond the distances of fall 61.047 c.m. (24.03"), 15.262 c.m. (6.008") and 3,815 c.m. (1.502") a day. The rapidity of fall increases with heat as the viscosity of the medium decreases.

These calculations give the theoretic rate of settling, but the actual experience shows a slower rate. Stokes' Law cannot in such a composite get full realization—the particles are not full spheres—some are spicules, some platelets. Some may be so ranged as to combine with the oil in solution or in a naturally stable colloid. Some may be under the weight or size essential for breaking the surface tension, overcoming the plastic inner friction or the viscosity of the oil. In the beginning the multiplicity of particles may delay precipitation in the medium, though when flocculation comes the deposit may be quickened.

In two liquids immiscible or only partly miscible, the particles or droplets show somewhat the same stability features as above. Stokes' Law, however, obtains a fuller verification, for the droplets are nearly spheres unless the volume of the disperse phase exceeds 74 per cent. of the total liquid. Liquid dispersed droplets are stable in a liquid medium when they are of molecular size or when they are sufficiently within collodial limits. With an emulsion of oil in water, the oil droplets do not separate from the water till they are above 1 μ. in size. Stable emulsions may be formed of one part of oil in ten thousand parts of water.

It has been stated that Stokes' Law does not obtain its full results in a medium of liquid hydrocarbon. While the rate of precipitation for particles and droplets corresponding to the screens mentioned above, is under that stipulated by the formula it is still too rapid to admit of using the fuel save in very rare instances. Oil and pulverized coal in common composites have not made a practical fuel. The coal, being heavier than the oil, has settled in pipes and preheaters, choking them. It has settled similarly to the bottom of the storage tanks. This has operated against such perfect combination as would secure simultaneous combination of the components. Oil and tar in combination have heretofore shown the same inadequacy. Constant stirring has been tried in remedy, but ineffectually, for even in a short pipe system congestion and clogging have been inevitable. No simple composite has until now been given sufficient stablity to make it equal to the practical needs of industry.

Action of Protective Colloids.

Considerable experimenting has been done in the matter of suspending particles in liquids and some prior experience has been gained chiefly with colloids. Particles well within colloidal limits are known to be naturally stable in some liquids. The stability may be broken and the particles precipitated by certain substances, as for instance by electrolytes. Unless a larger amount of precipitant is administered, protective colloids will block precipitation. Several of these protective colloids are listed. They include gelatine, the glues, casein, gum arabic, sodium oleate, dextrin, silicic acid and aged stannic acid. Just what form of defense protective colloids create chemists have not yet decided. Some believe that the particle is enveloped with a film, some that electric forces are aroused which affect the surface tension, the apparent specific gravity and other factors of stability. It is probable that several influences combine to produce the results with protective colloids. These seem to have some marked effect upon activitis since they are found also to delay both the settling and floating of particles regardless of a preciptating agent. Before the Colloidal Fuel research began, it was known that the influence of some protective colloids extended in a certain measure to suspensions. For example, the casein and albumin in milk act as protective colloids for the fat particles. Raw sugar hinders a red phosphorus suspension from settling. Gelatine acts similarly upon certain bacteria.

Industrial Uses of Colloid Condition.

The art of suspending as colloids in liquid hydrocarbons certain carbonaceous substances has been long practised. Lubricators are in use made of less than 1 per cent. of Acheson graphite of 2.1 specific garvity reduced so that the size of the particles is about 75 $\mu\mu$. (within colloidal limits) and suspended in oil by the addition of gallotannic acid. Colloids of charcoal and lampblack are known. It is also reported that if coal is reduced under high pressure or high speed disk grinding and lengthy trituration in oil (which time may be shortened by the use of a colloid to decompose the coal), the coal may be brought into the state of a stable combustible colloid. Precipitation of up to 3 per cent. of graphite whose particles are above colloidal size is delayed by the use of castor oil. The castor oil is stated to envelop the particles in a film and the stablity induced is sufficient for lubricating uses.

Suspension of high percentages of particles above colloidal sizes is, however, without precedent. So also the peptization of carbonaceous matter in liquid hydrocarbons, producing a stable composite, is new. No prior art exists for producing a stable fuel of oils having carbonaceous matter as natural impurities, like the asphaltum and free carbon found in pressure still oil or tar. In another field, that of rendering stable a compound of two or more unmixable or partly mixable liquid hydrocarbons for fuel needs, any prior art is also of little record. Many liquid hydrocarbons mix with others. Others and these of the important burning hydrocarbons have till this time proved obdurate to union—for instance, fuel oil and tar have heretofore refused to mix or have mixed only partially. Emulsions have been made of non-mixing liquid hydrocarbons for use in creosoting and disinfecting, but no such emulsions much less suspensions concerning unmixing liquid hydrocarbons for use as fuels have heretofore been created. The British Admiralty, as was well known during the war, faced a most serious problem in relation to its fuel supply. On April 28th, 1918, it offered a reward for "a fuel oil suitable for admiralty uses made by admixture of dehydrated coal tar with mineral petroleum oils." This offer is an important testimony to the

fact that no suitable process was up to that date known to the highest authorities of the Allies.

War Impetus to Research.

It was because of the mortal issues swaying upon the command of the seas by the Allied Navies and their serious shortage of fuel that the writer renewed the search for a solution of this vital fuel problem. He undertook it in connection with an organization that should be passingly reviewed. Shortly after the United States entered the World War, about a hundred of the largest firms, American and foreign, engaged in shipping, oil, exporting, insurance and other world-wide business, combined to form the "Submarine Defense Association" to devise means for combatting submarines. Among the concerns acting were the Cunard Company, the Nippin Yusen Kaisha, the International Mercantile Marine, the Standard Oil Company of New Jersey, the Texas Company, the United Fruit Company, the Armour Grain Company and many others. Among the Canadian firms one may mention: The France and Canada Steamship Company, North British and Mercantile Insurance Company, James Richardson & Sons, Ltd., and The Royal Insurance Company. The offices were in New York City. The chairman was Mr. Lucuis H. Beers, Counsel of the Cunard Company. Mr. John A. H. Hopkins was Vice-Chairman.

The writer was chosen Chairman of the Engineering Committee, the other members were Herbert Appleton, of Appleton & Cox; John R. Gordon, of the Union Sulphur Company; Ormsby M. Mitchell, of Power, Son & Company; Frederick W. Ridgway, of the International Mercantile Marine Company, and Ernest Smith, of the Vacuum Oil Company.

Several problems engaged the Association's efforts, and their work brought them into relations with the American, British and Japanese naval authorities, which most generously extended support and aid. Very early the shortage of the fuel supply for the fleet aroused the interest and the best endeavors of the Association. The vital units of the Allied navies had for some years relied chiefly upon oil for their motive power. Manifestly a right liquid fuel supply for the Grand Fleet was fundamental to sea control and to the winning of the war. The enemy centred efforts steadily upon cutting off the oil supply and the torpedoing of the tankers, with their inflammable contents and slow speed, was bringing a fateful shortage disastrously close. It was reported that Marshal Foch sent to the American authorities the following cable: "If you don't keep up your petroleum service, we shall lose the war."

Pulverized Coal vs. Colloidal Fuel.

In the face of the ominous situation, the British Admiralty sent to the writer drawings of the boiler installations of the Queen Elizabeth class of superdreadnaughts, asking whether such vessels could to advantage burn pulverized coal. Admiral W. S. Benson, Chief of American Naval Operations, who had been most helpful in cooperating, placed at the disposal of the Association the U. S. S. "Gem," to be operated under the writer's direction for research work during the war. Upon receipt of the British drawings, a conference was held with the leading American pulverized coal companies, and it was arranged to try out on this vessel several likely installation systems. Pulverized coal had been successfully used upon land, but naval experience was non-existent. The "Gem" was equipped with the highest class of Normand destroyer boilers, so the test could be conducted under right conditions and become authoritative. The demonstrations were clear that pulverized coal could be burned on shipboard and keep up steam. Since, however, pulverized coal required for storage nearly twice the volume needed for oil producing equal heat units, it was self-evident that the use of coal would cut down the steaming radius. As a ship's supreme service would be therefore lessened, for strategic reasons on battleships of the Grand Fleet, the use of pulverized coal could not be advised.

Research and Trial Tests.

Appreciating that despite all the advantages that were unquestionable in the service of pulverized coal for certain uses, it would not work out an adequate solution for this imminent naval fuel shortage, the writer turned again to the elusive but ever-alluring hope of a right means of combining coal and oil. This must conserve the oil without lessening the steaming radius and efficiency of the warships, since steaming radius was the very crux of their service. As far back as the eighties, or nearly forty years ago, he had taken up the study of this problem in conjunction with some other developments of a chemical nature. Incidentally to the latter process, he became convinced that the solution, if ever found, would lay along certain lines which he proceeded to develop. At his instance, through the courtesy of Mr. George Eastman and Dr. C. E. K. Mees, the facilities of the Kodak Research Laboratory at Rochester were opened to him in 1917 to try out the ideas and convictions which he expressed. Expert chemists, including Dr. S. E. Shepperd, Mr. J. G. Capstaff and Mr. L. Ebelin, were delegated to assist in the investigation of the laboratory aspects of the subject. As a result of many months careful study under his direction, it was verified that a composite could be made along the lines indicated. Numerous laboratory tests were made at Rochester. Later a supply of the composite was made elsewhere for marine service tests under th auspices of the Submarine Defense Association. From April to July, 1918, a series of tests were made aboard the U.S.S. "Gem," which were exceedingly successful. It was proved that the product created measured up to the requirements of industry, as well as to those of the laboratory. The vital transition and adjustment of a process from this essential yet preliminary and necessarily partial laboratory stage to that of practical industrial service was passed with success. The tests and demonstrations were witnessed during these months by officials of the United States and Allied Governments and Navies, and by representatives of many boards and business groups. About three hundred delegated investigators witnessed the operations aboard the U. S. S. "Gem."

Opening of the Industrial Field.

In November, 1918, suddenly the armistice brought the war to an end, and the naval crisis passed with it. The various bodies which had banded in volunteer efforts, for the myriad needs of the allied countries, felt that their tasks were done. Men were free again to turn to normal life and begin the vast task of reconstructing and revitalizing in the service of peace. As industrial fabric had been so seriously dislocated by the war, attention was turned from the crucial maritime emergency for which Colloidal Fuel had been devised to adapting it next for use in the myriad phases of economic industry. The writer, therefore, arranged to install a temporary equipment at the Sone and Fleming Refinery of the Standard

Oil Company of New York at Newtown Creek, Brooklyn. This installation was made because of the number of applications received from groups wishing to try the service of the new fuel for their special uses. It became desirable also to study and test the effects of numerous variations in components of the fuel. Early in the present year of 1919, the installation was ready, and from March to July, 1919, various further grades of Colloidal Fuel were made and boiler tests conducted. These series of tests confirmed the earlier demonstrations and opened up new fields in the utilization of the tars. Now (in December) steps are in progress for installing the manufacturing equipment in several important industrial plants.

The new fuel has passed through the preliminary and laboratory stages, has had broad and varied trials, testings and adjustments and has entered upon the path of extensive and intensive application. On November 15, 1918, the Executive Committee of the Submarine Defense Association passed unanimously a vote congratulating the writer upon the achievements of his department of the volunteer work, "particularly upon his new Colloidal Fuel, whose effect upon naval service and upon industry promises to be far reaching." On March 1st, 1919, just prior to the dissolution of that War Organization, the Committee announced to the public, the creation and success of "the new Colloidal Fuels developed under its auspices since the United States entered the war, and now fully tested and demonstrated."

The literature of Colloidal Fuel is, naturally, very recent, and also, naturally, very limited as yet. The matter had to be kept strictly secret during the war and publications were carefully edited. Several authoritative articles have, however, been published regarding it. The Submarine Defense Association published certain reports of its own, among which may be mentioned "Colloidal Fuel Composites of Oil and Carbon," by Mr. Lindon W. Bates; "Navy Fuel Oil Specifications and Colloidal Fuel," by Dr. S. E. Sheppard; "Tests of Colloidal Fuel and Pulverized Coal on Shipboard," by Mr. Haylett O'Neill. The writer has published two other pamphlets entitled "Colloidal Fuel-Properties, Tests and Costs" and "Collodial Fuels, Their Relation to Coal, to the Production of Power and Heat and to Fire Prevention and Insurance." During the war, the process of manufacture was for military reasons necessarily kept secret. After its close measures were authorized to obtain for the new creation the protection to which it was entitled in all the leading countries. Recognition of rights has now been established, so that it will be shortly permissible to publish the details of the process of manufacture.

Problems of Colloidal Fuel Manufacture.

Meanwhile, in general terms, one may discuss the scientific basis of the processes and the features of the product. The problem is primarily one of obtaining adequate stability. Pulverizing the coal to such dimensions that the particles enter into a molecular, colloidal or practically colloidal state with the liquid hydrocarbons helps to develop whatever is inherent of natural stability. But securing this natural stability is arduous and not adapted to practical industrial needs. The extent of diffusion or scattering of the particles and their conditions in the liquid medium have, however, important connection with stability. The extensive tests instituted demonstrated that if the components are properly mixed and treated with the right agents the particles do not require such fine reduction. It is evident that size and weight of particles are not the only elements involved. Absorption, surface tension, electrical attractions and repulsions, plastic inner friction—these as well as the original division of the carbonaceous substances, play their part in the total of influences. One may say that four distinct but related methods of stabilizing have been evolved. They may be used separately or combined. The combination method is usually the most economic. The use of certain agents and treatment in a homogeneous composite call some or all of these factors apparently into activity. Tannin, while serving the purpose of Acheson, does not avail here. It seems to lack sufficient protective strength to stabilize the mass of particles above colloidal dimensions. Certain other substances, however, do avail to artifically stabilize in liquid up to about 40 per cent. by weight of carbon particles, many of which are above colloidal limits. It has also been discovered that particles above colloidal limits may be at the same time stabilized and peptized.

Peptization of Coal.

When a substance is dissolved, it gives up a film or layer to the enveloping liquid. In the process of peptization, some dissolving ordinarily occurs, but the particles take up part of the liquid medium. Over peptization, nevertheless, creates an unstable condition. Carbonaceous matter conchoidal in fracture and so apparently crystalloidal as is coal and similar carbonaceous materials are susceptible to peptization. Bituminous coals and lignites readily respond to such treatment. The peptized carbons become somewhat spongified and cavitated. The peptization treatment has a further decided influence in dissolving and stabilizing at temperatures above the normal. The study has disclosed another important scientific fact, which is, that with two or more unmixable or partially mixible liquid hydrocarbons stability may be also successfully induced. In the endeavors heretofore to unite tar and oil and pulverized coal and oil, a liquid fuel only has been sought. The discoveries of Colloidal Fuel give not only liquid fuel, but a mobile paste and a mobile gel. One of the primary advantages—that of atomizability—is secured to all of these products as is also the simultaneous combustibility of their constituents.

As was remarked, up to 40 per cent. by weight of pulverized coal can be suspended in oil, in the liquid colloidal fuel. Up to 75 per cent. of carbon can be incorporated in the mobile pastes. Mobile gels can be made from either the liquids or the pastes. Colloidal Fuel may be a combination of any two or more of the forms. It will be understood, therefore, that between these states in varying blends and degrees of load, a large number of fuels either liquid or mobile may be produced. Further, several of the forms have a natural tendency to transform themselves. For instance, liquid Colloidal Fuel stabilized for liquidity during a definite period of say, days or months, tends later to gel from the bottom of the container up. At that stage, the viscosities of the lower or gel stratum will be different from that of the thinner upper stratum. The fuel, nevertheless, has not given up the influence of its treatment. It remains atomizable even though the gel be denser. In both layers and in the intermediate layers also, all the constituents are present and synchronize in burning. The gel thus formed is easily restored to liquid state by heat or stirring or pumping. Sometimes even a tap upon the wall of the container will restore the pristine liquid form. The colloidalizing treatment while artificially stabilizing the composite promotes also a gel formation.

Conversely, the creation of a gel even in early stages helps to stabilize the compound since particles with more difficulty precipitate in a gel.

Colloidal Fuel is a composite whose particles are in three states of dispersion:—solution, colloid and suspension. They give the characteristics of the three conditions. Some of the particles pass through a filter—many do not. Many are visible and measurably under microscopic inspection. Others are not. Some show active Brownian movement; others show slower movement; others no such motion at all. In considering the changes and stabilization under the treatment of Colloidal Fuel, the division of the carbon surfaces must be noted. A cube of coal one centimeter on each side exposes a surface of six square centimeters. Such a cube pulverized so that 85 per cent. passes through a 200 mesh screen exposes surfaces of about 1872 square centimeters. The ratio of surface to volume has multiplied over 300 times. Such a cube reduced to colloidal size (or .1 diameter) develops a surface of 60 square meters—a multiplication of one hundred thousand[6].

In Colloidal Fuel, most of the carbon particles are not reduced to colloidal sizes. Many remain much above these limits and above the colloidal borderland.

Material Suitable for Manufacture.

Coming to the study of the manufacture of the fuel, it is highly important that a wise and right selection of the components be first made. A broad latitude, however, exists, which is one of the elements of the economy in the new creation; for virtually all classes of carbons susceptible to pulverization or other manner of reduction to particles are available for combining with liquid hydrocarbons for the creation of Colloidal Fuel. Anthracite, semi-anthracite, bituminous and semi-bituminous coals, as well as lignites and peats, are usable. Anthracite culm, dust and slush, bituminous and lignite slack, screenings and dust, and also coal "seam dirt"—all these of suitable quality are amenable. To these may be added pressure still, smelting and gas house coke and charcoals. Various grades within these groups have been used. Also certain cellulosic and semi-cellulosic by-products, such as waste from starch, corn and flour factories, wood pulp, wood dust and disintegrated peat and lignite are available. Woods when properly pulverized serve also the cause of Colloidal Fuel. Carbons of relatively high ash and sulphur content may be incorported. As a result of the pulverizing and colloidalizing treatment, the new fuel when burned does not leave, as with pulverized coal, masses of slag. Most of the ash passes off with the gases, the rest falls to the bottom of the grate in fine powder. The sulphur content, which is of vital moment to certain industries, can be averaged down by blending the product with liquid hydrocarbon containing proportionally less sulphur. Several kinds of carbons may be used together.

Preparation of Coal.

For the manufacture of the new fuel, the coal should be reduced so that about 95 per cent. passes through a 100 mesh screen and 85 per cent. through a 200 mesh screen. A finer pulverization, while of advantage, is not essential to the process. Coarser particles than those cited above may be temporarily or partly stabilized, serving sufficiently well certain fuel uses. In all coal pulverized to pass through a given screen, it is manifest that many particles are smaller than those which just succeed in passing. A general proportion is observed. For instance, if carbon is so ground that 99.7 per cent. passes a hundred mesh, a four hundred mesh screen will be passed through by about 70 per cent. of the coal particles, and amounts progressively diminishing would be found to pass finer screens. The treatment for the Colloidal Fuel does diminish somewhat the size of the coal particles, but in the product many or most of the particles lie well above the colloidal sizes. For the reduction, mechanical, electrical or chemical means may be used, but an ordinary coal pulverizing ball or tube mill is most economical.

Range of Dispersion Media.

Turning to the dispersion medium employed, one finds that all liquid hydrocarbons which are usable as liquid combustibles, whether they mix or do not mix with others, such as oils, tars and pitches, may be used. The fuel has been made successfully with all the liquid hydrocarbons tried. In the list of those tried are various fuel oils, pressure still oil or tar and coal tar, both the by-product of coke ovens and of gas houses, and liquified road oils, wax tailings and other hydrocarbons. By "pressure still oil or tar" is meant the residual left from topping and cracking a paraffin base oil in pressure stills. Liquid hydrocarbons of higher sulphur and water content than would otherwise be acceptable can be used for the new fuel, since it is possible to average down the sulphur and water in the process of manufacture. Solid hydrocarbons are also available when liquified. Carbohydrates are included, as hydrogen and carbon are found in them, if when liquified they fall into any of the above-mentioned groups. Several liquid hydrocarbons may be blended.

To carry the load of a high percentage of carbon, the liquid should be of approximately a certain viscosity which the treatment secures. While a lower viscosity does not hinder the creation of Colloidal Fuel, it lessens the load which the liquid hydrocarbon can stably carry. If the product sought is to be a gel or paste, the initial viscosity is of less concern. If the liquid medium provided is of over high viscosity to produce a liquid fuel with the percentage desired of load, a "cut back" can be introduced to lower viscosity. This "cut back" can be of another suitable hydrocarbon. If the medium provided is of over low viscosity, the process is reversed and the viscosity is raised by introducing a liquid hydrocarbon which adjusts the density. Several other ways, of course, exist for securing the right viscosity, such as for instance heat and emulsification.

The Fixateur.

With the right quality of fixateur or peptizing agent, stability is most readily and satisfactorily secured through its use. Varying the amount introduced makes adjustment simple. In general, the shorter the time the less the degree of stability desired, the lower the tmperatur, the less the load and the finer the grinding, so much less fixateur or peptizing agent is needed. If a gel or paste is required, less of the agent is essential than if a liquid is sought. The introduction of more agent than is demanded for liquid stabilizing begets a tendency to early, complete and consistent gellification. The amount of the agent therefore introduced, must be a matter of knowledge from experimentation. It must be such a quantity and quality as will secure adequate stability at the temperatures of storage and preheater. In practice, virtually, the maximum of a good quality of fixateur which has ever been employed to secure a stable liquid is an amount which adds 2 per cent. by weight of the essential substances to

[6] Ostwald, "Theoretical and Applied Colloid Chemistry," 1917 page 118.

the fuel. The minimum producing an appreciable result is about .1 per cent. Ordinarily between ¾ per cent. and 1½ per cent. is used. Higher percentages of certain peptizers or stabilizers are required. If gaseous means are used these percentages do not hold. Between these outer limits the quality of fixateur and peptizer for particular products has been very accurately determined by experience and the effects recorded of different percentages blended with various ratios and kinds of components of the Colloidal Fuel.

Some of the experiences in regulating the life of stability deserve record herein. In the first instances given, the carbon was ground so that 97.5 per cent. passed a hundred mesh screen and 95 per cent. passed a two hundred mesh screen. In the latter instances, the 99.7 per cent. of the carbon passed a hundred mesh screen, 89 per cent. passed a two hundred mesh and 85 per cent. passed a three hundred mesh screen. In the first instances, the special gravity of the oil was .924, in the last two .943. The specific gravity of the pressure still oil was .96. Of the coals, the specific gravity of the Pocahontas was 1.39, of the semi-anthracite 1.8, of the coke 1.7. Some ten days stability was secured in a composite of 40½ per cent. pressure still oil, 3 per cent. wax tailings, 15 per cent. road oils, 1½ per cent. fixateur, 40 per cent. pulverized anthracite coal. Over three months stabilization has been shown in a composite of 50½ per cent. pressure still oil, 3 per cent. wax tailings, 15 per cent. petroleum pitch, 1½ per cent. fixateur and 30 per cent. coke. Over six months stabilization was recorded in a composite of 3 per cent. middle fraction oils, ½ per cent fixateur, 5 per cent. coke oven by-products tar, 56½ per cent. pressure still oil and 35 per cent. ground Pocahontas high volatile bituminous coal. About 99 per cent. of particles of coal remained suspended for forty-five days in a composite of 66 per cent. Texas Navy fuel oil, 2 per cent. wood dust, 2 per cent. fixateur and 30 per cent. low volatile and high volatile bituminous coals mixed. In a combination made up of 68 per cent. Texas Navy fuel oil, 1 per cent. fixateur, 1 per cent. wood dust and 30 per cent. coal, 95 per cent. of the coal particles remained in suspension for forty-five days. During the period of stabilization of life of the fuel, rarely does as much as 5 per cent. precipitate. When the period of duration for which the composite is prepared passes, settling begins and slowly progresses. Stability may be renewed in several ways. Ordinarily stirring or heat may suffice or sometimes more fixateur may be required. When after the liquid stability duration passes, a gel is formed, the usability of the product is prolonged, for serviceability is not necessarily forfeited by such densifying. In all these discussions stability is taken as that adequate stability of a liquid which insures suspensions equal to the need and to the simultaneous consumption of components. We are discussing practical industrial economical service—not academic or laboratory experiments. The stability of Colloidal Fuel is arranged for a temperature of storage between 20 degrees C and 30 degrees C. At higher temperatures, this blend of fuel has a shorter period of stability, but the manufacturing treatment can usually adjust the composite, as has been said, to such degrees of storage or preheat and length of stabilization as is desired. Even at high preheat temperatures, the particles do not settle with enough rapidity to clog the passage through pipes or other parts of the apparatus. While larger amounts of fixateur, peptizer or stabilizer than the case calls for, and other lesser differences of treatment do affect the product, only in rare cases can this annul the fuel's use. Lesser amounts and less rightful treatment also affect the product, but they merely lessen the degree and duration of the stability or they diminish the density and consistency of the paste or gel.

Machinery for Manufacture.

We turn next to a review of the apparatus needed for the manufacture of Colloidal Fuel. The first element is a mechanism for suitably pulverizing the coal or other carbonaceous matter and blending the fuel fixateur and other colloidal components. Existing pulverizing machinery may, with very small modifications, be adapted to serve as a unit. The carbon may be ground apart or the pulverization may go on simultaneously with the treatment instituted for combining it with the liquid medium. Similarly, the fixateur may be prepared apart and in advance, or its components may be united when the fuel constituents are being treated. It may be added to either component separately or to both before combining or after combining. In other words, while the processes may be separated and only a final combining be planned, on the other hand, the introduction of new components and the withdrawal of those already treated may occur simultaneously. The process may combine all the functions and treatments and give the finished product, so a continuous process of manufacture may be secured. The apparatus is simple, requires but small area, is relatively inexpensive, so that the item of manufacture cost is not large.

Colloidal Fuel carrying up to 40% of carbon is practically equivalent to the class of heavy oil in relation to handling to the preheater stage. At 20° C its viscosity will hardly be below 65° Engler, except when only the carbon particles found in pressure still oil are stabilized. The viscosity ordinary will range between 160° and 350° Engler, depending upon the elements and other factors. At higher temperatures that obtain in the preheater, it behaves as do the lighter class of oils. Adding the carbon makes no radical change in the viscosity of the already viscous oils. Colloidal Fuel is really only a laden, stabilized oil and the problem of burning both is largely the same. The installations for burning oil, burn liquid Colloidal Fuel without any material change. Some slight modification is required for burning the pastes and gels since there must be sufficient pressure to carry the fuel to the atomizer. If the gel is broken up by pumping, or if it becomes liquid in the preheater, pressure for conveying it alone is needed. Existing mechanical or steam oil burners are adapted to Colloidal Fuel. Several varieties have been used.

Advantages to Coal Trade.

From the point of view of the coal trade, Colloidal Fuel's arrival is of decided assistance. The waste coal products may be used, and the broken carbonaceous substances increased in utility. Coal can hold a part of the market now invaded by oil, and if pastes are employed it can hold a major part of the choicest markets. From the point of view of the oil industry the advent of the new fuel should not be considered that of a rival, but rather that of an ally. By combining solid carbons with the liquid the fire hazard of oil and the deterioration of oil in storage may be ended through a water seal. Oil may be made available for domestic household uses—a market which oil with its fire hazard now has difficulty in entering. Oil companies

will be able to serve more clients if a part of the liquid fuel is made up of carbonaceous substance, and the more clients a concern has the greater is its business advantage. Whereas now it is hard for the oil companies to convince concerns having large coal dumps on hand or contracts in force, to shift to oil, the use of these coals in the liquid fuel will warrant the plants in changing to a liquid basis. These are the broad and substantial advantages of Colloidal Fuel to the oil industry. The market is so vast that neither solid nor straight oil fuel can gain a monopoly. Colloidal Fuel makes of coal and oil "friends, and not enemies."

Colloidal Fuel means that Canada and Great Britain can obtain over 50% of their liquid fuel from the products of their own soil. Canada need export for fuel but half the amount of national money that it now pays out as tribute to the United States.

Lindon W. Bates,
71 *Broadway,*
New York City,
December, 1919.

Manufacture of Methyl Ethyl Ketone from Normal Butyl Alcohol

By T. C. NEWMAN

WHEN normal butyl acetone began to be produced in large quantities early in 1917 by the British Acetones, Toronto, Limited, the question of its disposal soon became urgent. A slight effort was made to use it to replace ethyl alcohol as a solvent in the manufacture of smokeless powder, but its high boiling point and low water solubility precluded its use for this purpose. Since then, from a commercial aspect, the problem has solved itself, butyl acetate is very rapidly replacing amyl acetate as a nitro cellulose solvent, and this is so for several reasons, namely, the butyl alcohol is remarkably pure, 90—95 per cent. of it boiling with 05°C of the true boiling point of butyl alcohol; the odor of butyl acetate is not nearly as oppressive as that of amyl acetate; its tecnical effect is just as good, and it is much cheaper in price. But this demand arose gradually and the alcohol itself was piling up day by day.

At the same time the British Government was greatly in need of acetone for its cordite manufacture, and all sources combined could not supply her tremendous demand. The nitro cellulose in cordite being of 12.8—13.1 per cent. nitration, the alcohol-ether mixed solvent would not colloid it. At first glance there is no relationship between normal butyl alcohol and the solution of this question, but in the chemical laboratory of the British Acetones, Limited, under the direction of Mr. D. A. Legge, the following process for the conversion of the alcohol into methyl ethyl ketone was evolved. Before proceeding beyond a small experimental plant, a sample of M. E. K. was submitted to the Government, who accepted it as a cordite solvent, and used it under the name of "Cordite Ketone."

The theory of the process is often found in organic text books. The normal butyl alcohol is dehydrated, forming butylene. This butylene is then treated with hydriodic acid, forming butylene hydrogen iodide or beta iodo normal butane. This is then heated with wet silver oxide which yields the secondary butyl alcohol. The secondary butyl alcohol is then dehydrogenated, yielding the methyl ethyl ketone. Of course, this is suited to the laboratory, but for a plant using 25,000 pounds a day substitutes for hydrogen iodide and silver oxide had to be found, and in practice sulphuric acid, and water, were used.

Detail Commercial Process.—To dehydrate the normal butyl alcohol the usual method of passing the hot vapor over kaolin was used. The catalysers, instead of being one long unit, were made up in batteries of three small units, each unit being held 40°C higher in temperature than the previous. A heat transfer system was installed so that the hot vapors from the third unit heated the cooler vapors from the second, and so on. The catalysers were electrically heated, and the highest temperature maintained in them was markedly lower than that used in the manufacture of ethylene for mustard gas. Of course, the other plants were handling another molecule. We might have had to use higher temperatures in the case of ethyl alcohol. The kaolin was used in the form of small cakes and once its catalytic activity was materially weakened, it was removed and heated to a high temperature which served to revivify it. The chemical transformation of the alcohol to the olefine was complete as long as the catalyst was not used too long or pushed too hard.

Each battery was designed to handle a fixed number of gallons of butyl alcohol per hour, and to insure it against overfeeding, a constant flow pump was designed which could be set to deliver any fixed amount per hour.

The hot vapors from the catalysers were passed through a gas cooler, and then a gas separator which separated the butylene from the water. The butylene was held in gasometers, and was next compressed by an ordinary ammonia pump. The liquid butylene was kept in high pressure storage tanks, and, as needed, was pumped to a sulphating kettle which was water jacketed and specially built to withstand high temperatures and pressures. The sulphuric acid used was 60 per cent., and this reaction was extremely exothermal and the difficult part of the whole process. During the experimental stages there was a distinct tendency for dibutyl-ether to form here, but this was overcome by details of plant operation rather than any deep-seated change.

This butylene hydrogen sulphate was diluted and distilled, and, being unstable, the secondary butyl alcohol was formed and the sulphuric restored. The latter was then pumped back to the acid concentration plant, of which there were two 30-ton units, to be reconcentrated. The secondary butyl alcohol was redistilled to free it from water, and then passed through a second series of catalysers similar in design to the first, in which it was dehydrogenated. The catalytic agents used here were some of the metallic oxides. This material we bought in powder form and then fused for use as lumps. This fusing caused great trouble for a time, as the presence of small amounts of the free metal materially lowered the activity of the catalyst, but this was finally overcome by the designing of a gas-heated furnace in which a strongly oxidizing atmosphere was maintained. The M. E. K. from these catalysers was passed through coolers and then

separated from the hydrogen, but to insure that no ketone escaped with the hydrogen, the gas was passed through a scrubbing column, against a stream of water, and this liquor was later salted and distilled, any ketone recovered being added to the crude M. E. K. This was distilled and the pure methyl ethyl ketone recovered pure on one distillation. The methyl ethyl ketone manufactured by this process was very pure, the only impurity ever found being slight traces of the pinacone, and that only after the careful distillation of large quantities of the M. E. K. This process approximately tripled the output of cordite solvents for the British Acetones, Limited, and by the end of 1918 this company's output would have been sufficient to supply the entire needs of the British Army and Navy with respect to this war-time necessity.

The commercial future of this process and this chemical, like many others, rests in abeyance at present. The process efficiency obtained was high, varying around 90 per cent., and this probably would have been increased, and the chemical could be turned out at a very reasonable price. It is an excellent solvent for nitro cellulose, but does not appear to be suitable for cellulose acetate, or, at least, it has not been met with favor so far. If a demand for it does arise, the plant is quite able to cope with it; if not, it at least illustrates how an apparently unsaleable by-product was transformed to help fill a very urgent wartime need.

The Inter-Allied Conference of Chemistry and the International Council of Research

REPORT OF INTER-ALLIED CONGRESS OF CHEMISTRY

Editor, Canadian Chemical Journal:

Dear Sir:—We are sending you a translation of the Report of the Inter-Allied Congress of Chemistry. This document is, we believe, a very important one and should be given considerable publicity.

The Canadian Institute of Chemistry was fortunate in the offer made by one of its Fellows, namely, Dr. Ruttan, to undertake such representation of the Institute in England as might be deemed desirable. The Institute upon hearing from Dr. Ruttan, wrote to Dr. Miall, Secretary of the meeting in London, stating that Dr. Ruttan had been appointed by the Institute as its representative to follow the chemical developments that might occur. Owing to this representation, the Institute has been enabled to have a first hand report of all the various meetings referred to in the present translation.

The Canadian Institute of Chemistry is the body which will represent Canada in the Inter-Allied Chemical Union. Canada is entitled to two representatives in the Inter-Allied Union of Chemistry, Pure and Applied, and arrangements will be made for such representation at the next meeting of the Union which will probably be held at Rome.

Owing to the fact that the Institute was not thought, at the time Dr. Ruttan left Canada, to be sufficiently well organized to represent the views of the majority of the chemists of Canada, Dr. Ruttan was unable to pledge the adherence of Canada to the International scheme. This adherence may, and will be taken care of by the Institute at some time prior to the next International meeting.

The importance of having a National Federation of Chemists in Canada is only emphasized by such an Inter-Allied Convocation has just been consummated.

Yours truly,
CANADIAN INSTITUTE OF CHEMISTRY,
Per Harold J. Roast,
Montreal, Jan. 5, 1920. Sec.-Treas.

(Note)—Translation from the French Report of proceedings of the above Councils.

THE Inter-Allied Conference of the Associations of Chemistry, pure and applied, has held its second session at London, from the 14th to the 18th of July, under the presidency of Mr. Charles Moureu, Member of the Institute, Professor at the College de France. It preceded by a few days the Congress of Scientific Academies, assembled at Brussels from the 18th to the 28th of July, 1919, under the auspices of the Belgian Government.

These dates will be remembered in connection with one of the most important events in the history of chemistry: The Constitution of the International Union of Chemistry, Pure and Applied. They will ever be associated in our memories with those that marked the home-coming of the victorious allied troops in the French, English and Belgian capitals. Their remembrance will only serve to strengthen our willingness to undertake collectively all the labors that force themselves upon us as to their co-ordination and co-operation.

Following the reception of Mr. Paul Kestner, President of the Societe de Chimie Industrielle, by the Society of Chemical Industry, in London, last November, the project was formed to group all the allied chemical forces into a powerful nucleus. The war had pointed out the need of establishing a more complete connection between the several nations engaged in a struggle against the Central Empires. It was important to avoid losing the benefit of a fruitful co-operation of several years' duration. The great associations of chemistry of the allied nations owed it to themselves to carry it on in time of peace, with the same spirit of advancement and ideal that had governed all of the collective realization obtained during the war.

Acting on these considerations, la Societe de Chimie Industrielle convoked a first conference on the occasion of the visit of Prof. Henry Louis, President of the Society of Chemical Industry and called a meeting in Paris, last April, of delegations composed of eminent characters of the scientific and industrial world from Belgium, the United States, France, the United Kingdom of Great Britain and Ireland, and Italy.

Many meetings were called, in the course of which, it was decided to invite the associations from each country to constitute themselves into a federation or to create a national council, so as to confederate these diverse organizations and thus form an inter-allied group, with the later co-operation of neutral nations. The main lines of the statutes were defined. A provisional council was elected to establish the definite foundations of the confederation. Each of the nations represented selected 4 delegates, a representative of pure chemistry, and a representative of applied chemistry as its members:

Belgium—Prof. Chavanne, Prof. Crismer.
United States—Dr. Frederick Cottrell, Lieut.-Col Zanetti.
France—Prof. Chas. Moureu, Mr. Paul Kestner.

United Kingdom of Great Britain and Ireland—Sir William Pope, Prof. Henry Louis.

Italy—Prof. Emanuele Paterno, Mr. Leopoldo Parodi-Delfino.

The provisional council was entrusted with the preparation of another conference and charged to connect itself with scientific acadamies, who, on the other hand were drawing up a general plan of international organization to fulfill the needs of the various branches of the scientific and industrial researches. This task was more particularly entrusted to Mr. Charles Moureu, President of this Council, who, in his capacity of member of the Commission for International Co-operation in Chemistry, created in the midst of scientific academies, was all designated to secure with them the necessary relationship.

The London Conference could therefore study a definite program. Its task was made all the easier because all the details pertaining to the organization of the Union had been settled perfectly by Dr. Keane and Dr. Stephen Miall, president and secretary respectively, of the London section of the Society of Chemical Industry. This introductory step towards a new manifestation of chemical understanding is moreover entirely due to that important British association. The cordiality of the welcome of the Society of Chemical Industry is only equaled by the courtesy of its warm receptions and its amiable hospitality.

The Paris conference had inaugurated a new era of connections of joint interest between the members of inter-allied chemistry; the London Conference has sealed in a definite manner the friendship which from now on binds them together. Its results have shown the considerable work which it is indispensable to achieve. The task to be accomplished is immense, but it is comforting to think that the understanding which has been established between all the nations represented will enable us to meet with a full front all the problems that are facing us. The main purpose of this Conference was to constitute on a firm basis, the new Confederation of Chemistry, and to determine the details of its working. The delegations were composed as follows:

Delegates to Coference.

Belgium—R. Lucion, former president of the Societe Chimique de Belgique, Sc.D., Engineer with Societe Solvay & Cie.; J. Timmermans, Professor at the University of Brussels.

United States—Frederick Cottrell, Ph.D., Chief Metallurgist, U.S. Bureau of Mines; Charles L. Parsons, D.Sc., Chief Chemist, U.S. Bureau of Mines, Secretary of the American Chemical Society; Edward W. Washburn, Ph.D., Professor of Ceramic Chemistry and head of the Department of Ceramic Engineering, University of Illinois, Past Chairman of the Division of Chemistry and Chemical Technology of the National Research Council of the U.S.A.; Robert F. Ruttan, M.A., M.D., D.Sc., Director of the Department of Chemistry, McGill University, Montreal, President of the Royal Society of Canada, Member of the Advisory Council for Scientific and Industrial Research.

France—A. Behal, Membre de l'Academie Medecine, Professor at l'Ecole Superieure de Pharmacie; J. Gerard, Chemical Engineer, General Secretary of the Societe de Chimie Industrielle; P. Kestner, President of the Societe de Chimie Industrielle; Ch. Marie, D.Sc., General Secretary of the Societe de Chimie Physique; R. Marquis, D.Sc., Editor-in-Chief of the Bulletin de la Societe Chimique; Ch. Moureu, President of the Inter-allied Council and of the Federation Francaise des Associations de Chimie, Member of the Institute, Professor at the College de France.

United Kingdom of Great Britain and Ireland—F. Frankland Armstrong, Esq., Member of the Council of the Society of Chemical Industry; Henry E. Armstrong, Esq., F.R.S., Emeritus Professor of Chemistry in the Imperial College of Science and Technology, Past President of the Chemical Society; A. Chaston Chapman, Esq., Past President of the Society of Public Analysts; Henry Louis, Esq., Professor of Mining and Metallurgy in the University of Newcastle-on-Tyne, Past President of the Society of Chemical Industry; Sir William Pope, K.B.E., F.R.S., Professor of Chemistry in the University of Cambridge, Chairman of the Federal Council for Pure and Applied Chemistry, Past President of the Chemical Society; W. P. Wynne, Esq., F.R.S., Professor of Chemistry in the University of Sheffield, Vice-President of the Chemical Society.

Italy—Dr. G. Pirelli, Societa di Chemica Industriale di Milano; Dr. Severini, Director della Societa Generale per la Cianamide.

Attaches to the Conference.

Dr. Stephen Miall, Esq., Honorary Secretary of the Society of Chemical Industry; Jean Voisin, Chemical Engineer, Member of the Council of the Societe de Chimie Industrielle.

Each delegation having brought the firm adhesion of its country, the Confederation was declared to be constituted. The Conference then examined a number of wishes expressed by the American Delegation, and a plan of statutes submitted by the French delegation. After several sittings given entirely to the examination of these documents, which aroused very interesting interchanges of views and ideas on the future of relations between English and Latin countries, and on the share each great nation is likely to have in a program of general action, an agreement was soon reached on a text presented by a special commission presided over by Sir William Pope, the distinguished president of the British Federal Council.

The Statutes being adopted, the Conference went on with the election of the Bureau of the Confederation in which the five nations are thus represented:

President—Mr. Charles Moureu (France).

Vice-Presidents—Mr. Georges Chavanne (Belgium), Mr. Leopoldo Parodi-Delfino (Italy), Mr. Charles L. Parsons (United States), Sir William Pope (United Kingdom of Great Britain and Ireland).

General Secretary—Mr. Jean Gerard (France).

The Confederation decided to maintain its provisional office in Paris, 49 rue des Mathurins, and set June, 1920, as the date of its next meeting which is to be held in Italy. It still remained to determine exactly the work and proper place of the Confederation among the organizations foreseen by the Congress of Scientific Academies and connected with the International Council of Research. The Scientific Academies of the allied nations had held a meeting in London on the 9th, 10th and 11th of October, and in Paris on the 26th, 27th, 28th and 29th of November. They had voted many resolutions to the effect that convenions held by international scientific associations were to be called by the competent groups of nations at war with the Central Empires. They had also set down this principle: That new associations, recognized as useful to the progress of science and their applications, would be established by these same nations with the later co operation of neutrals.

Their general plan of organization included the constitution of an International Council of Research, whose aim was to co-ordinate the international scientific activity in the various branches of Science and its applications; to encourage the creation of International Associations or unions where judged helpful to the progress of science; to direct the international scientific activity where no competent associations are extant; to get in touch, by proper means, with the governments of adherent countries with a view of recommending a study of the questions under their competency.

It only seemed natural that the Confederation should succeed the old International Association of Chemical Societies which was about to be dissolved. It only could hereafter function within the compass of the International Council of Research. Such was the opinion of the inter-allied Conference of London which adopted unanimously the following resolution: "That the Confederation be included with autonomous power within the compass of organizations forseen by the scientific academies, as the Chemical Section of the International Council of Research."

A delegation was immediately constituted to bring forward that motion and the plan of Statutes before the Congress of Scientific Academies which was to meet at

Brussels on the 16th July and whose Executive Committee had agreed to postpone the date of its Convocation, so as to await the result of the deliberations of the Conference of London, and to render possible the attendance of its delegates.

All the necessary powers were granted to the Congress in order to enable it to harmonize the adopted Statute with those of the International Council of Research and to come to an arrangement with its Executive Committee concerning the affiliation of the Confederation. The Conference applied itself to the nomination of individuals already designated by Scientific Academies to represent Chemistry at the Congress. This delegation was composed of:

Belgium—Prof. Chavanne, Prof. Crismer, Dr. R. Lucion, Prof. Timmermans.

United States—Dr. F. G. Cottrell, Lieut.-Col. A. B. Lamb, Dr. C. L. Parsons, Prof. E. W. Washburn, Prof. H. S. Washington.

France—Prof. Behal, Mr. J. Gerard, Mr.. Marie, Mr. Marquis, Prof. Moureu.

United Kingdom of Great Britain and Ireland—Prof. Armstrong, Sir William Pope, Dr. R. F. Ruttan.

Italy—Prof. A. Menozzi, Prof. Nazini, Prof. E. Paterno.

It was under these circumstances that the Re-union of the Commission for International Co-operation in Chemistry opened on the 22nd July in the Belgian Palace of Academies under the Presidency of the eminent scholar, Mr. Alban Haller. This Commission was entrusted by the Executive Committee of the International Council of Research with the study of the various questions pertaining to the Chemical organization.

Professor A. Haller communicated the results of the referendum which he had put before the members of t' Council of the International Association of Chemical Societies, in his capacity of President to obtain its dissolution conformably to the resolutions voted by the Scientific Academies.

The numerous positive answers received formed a large majority. The old Association was declared to be dissolved. The funds with which it had been endowed were to be re-imbursed to the donator, Mr. Ernest Solvay.

The dissolution of the International Association being an accomplished fact, it was now necessary to take up the new organization. Professor Charles Moureu submitted a report of the labors of the Conference of London. His conclusions were heard. The Assembly adopted in principle the Statutes of the Confederation under the reserve of some slight modifications which a Commission comprising one delegate from each nation had been entrusted to bring forward, so as to make the Statutes consistent with the International Council of Research and to get them to agree with those of other International Unions, which are attached to it.

The Commission for International co-operation in Chemistry devoted its next meeting to the examination of these Statutes and approved them definitely. Its task was terminated. Mr. Haller tendered his resignation as President. Mr. Charles Moureu succeeded him to the Presidency of the Commission, which being transformed into a general Assembly, then ratified the nomination of the Bureau which had been elected in London.

This Bureau had to submit the Statutes of the Junior International Union of Chemistry, pure and applied, to the approbation of the Executive Committee and of the plenary Assembly of the International Council of Research. This was what took place on the 23rd and 28th of July.

Such is the history of the new group. Chemistry has from now on its charter. It only remains to make it active to realize its operations.

The Significance of Meetings.

The meetings of London and Brussels have been profitable indeed. Most of the great questions of common interest have been discussed. If no written report has resulted in order to regulate the procedings, it is bcause the members of the Conference wish to study their resolutions more completely and to submit, before anything definite is decided, to their respective nations, the observations they have deducted, not only from collective debates, but also from private conversations, in order, at the next session, to come to a decision with a full knowledge of the subject.

The field of work of the Union is very large. It has no limits. Chemistry is the most widely extended science. The multiplicity and diversity of its applications require that it should have, in the aggregation of organizations connected with the International Council of Research, a position in keeping with its importance and activity. In view of this fact this group of chemical forces should get resolutely to work with a clear vision of the task to be accomplished, with the conscientiousness of its duties and the will to carry on to the end, all the realizations that are incumbent upon it.

From the London Conference and the meetings at Brussels we may be allowed to infer that its action is likely to include several phases.

In the first place, a permanency of relations needs to be ensured between the organizations of chemistry of adherent countries. It is important to obtain, in view of the organization, the pursuance in common of certain investigations. The unifying of chemical nomenclature, classifications, measures and systems of units, methods of examination and analysis, type classing and conditioning of raw materials, technical and industrial standardization, etc.

The program to be considered must not stop there. It is not untimely to think of the creation of an international centre in which would be methodically assembled the whole of our present chemical knowledge, i.e., a complete collection of the total international intellectual productions in all the branches pertaining to Chemistry, and a museum of samples of raw materials and products of chemical origin.

Is it not equally needful to make great progress in the organization of documentary researches by compiling a bibliography, constantly revised, of the whole of the works published, of the patents registered, of articles from periodicals published in every country, and a catalogue of all the raw materials and products of chemical origin bearing an indication of their constants, and, if possible, their economic indications? This bibliography and this catalogue would constitute, so to speak, a history of chemistry, and would form the embryo of a systematic treatise of chemical science and its applications.

The progress of chemistry and the development of its applications require, on the other hand, that a great circulation be given to the newest original ideals, to the most recent inventions, to the most direct methods, to all the works that contribute to the chemical knowledge in the scientific and technical field. The publication of notes, extracts from articles, must be enlarged, completed and improved. England and the United States have already prepared for this kind of documentation. They will

enable the other countries to benefit by their experience. The good harmony of this work can only help the compiling of large general treatises and lists of constants.

Finally, it is time to destroy the walls of separation, so to speak, which still exist (although the frequency and regularity of communications are likely to cause them to disappear) between nations trying for the same ideal. It has become necessary to make easier the most complete expansion of thought and ideas by encouraging the exchange of publications offering a point of general utility, of books, pamphlets, periodicals, reports, rules, and documents, official and otherwise, between the public administrations, parliaments, libraries, museums, universities and associations.

It will be the function of the Permanent Office of the International Union to contribute to the realization of this program. Each nation will contribute its stone towards the erection of a common building by undertaking the execution of a part of the plan of action. The division of the work will help a good deal, and will allow the obtaining of speedy and sure realizations.

In this manner, by its effort and its action, the International Union of Chemistry, Pure and Applied, will share more and more largely in the progress of science and in the development of industry. By organizing the intellectual production, scientific as well as technical, by improving the social condition of labor, by establishing on a permanent basis the collaboration of allied nations, by encouraging the mutual help between men and groups, it will have contributed to increase the general well-being and the progress of humanity.

(Signed) JEAN GERARD.

NOTE.—An article dealing with the statutes of the International Union of Chemistry, Pure and Applied, will be given in the March number of this journal.—Editor.

Chemistry the Basis of Industrial Progress*

An Appreciation of the Work of the Chemist by the Minister of Trade and Commerce ---What Civilization Owes to Chemistry

By RIGHT HON. SIR GEORGE FOSTER, P.C., K.C.M.G.

RIGHT HON. SIR GEORGE FOSTER, having been introduced by the Chairman, Dr. Shutt, spoke as follows:

Dr. Shutt, Ladies and Gentlemen,—The Chairman was very wise in not committing himself to any statement of the lines I may follow in speaking to you this evening. He was wise, also, in taking his pleasure, and trying to persuade you to take your pleasure, by way of anticipation before anything had been said. I advise you to follow his example and suggestion.

I do not know why I am here to-night. I hope that I am not here under false pretences. I can bear testimony to one thing that Dr. Shutt said, and that was in regard to the pertinacity and confirmed obstinacy of your Secretary, who, once he started out on the quest, never let up until I had to give in. There is one valuable quality that you have—and by the way, he comes somewhat under the wing of my department. In fact, I was quite surprised to know what a large part I was of this Society. In matters of high-grade research, in the way of pure science or applied science, my department has been instrumental in providing you with the *fons et origo*. We have an advisory scientific committee, the head of which is Dr. MacCallum, who has graced us with his presence here to-night. So there you have a mentor, advisor, guide, analyst and synthesist, all in one.

Then, to my right there is another gentleman who did at one time, at any rate, come under the wing of my department. I do not quite know what happened him; he keeps his old quarters—he knows when he is well off in that respect—but he now gives his allegiance to another Minister rather than to myself. Still, in a certain way, he belongs to my department. And when you want to look at your films my department has the facilities for your doing so, having arranged, at some expense and with some trouble, a meeting-place where your films may be shown and where you can enjoy them. It seems to me, therefore, that I have a larger connection with your Society than I supposed before I came here. I assure you that the knowledge thus gained has quite compensated me for my coming out.

I do not know what in the world I can say to a practical, critical audience such as that which I have before me—you who are never satisfied with theories; who are always digging into the reasons and causes of things; pulling things apart and then trying to put them together again, nature having put them together in the first instance—in the process gleaning as much knowledge as you can as to how the wheels go round and of what the cogs are made. I cannot give you any advice. I cannot lead you along any lines of theories. I cannot analyze any of these things that you call atoms or electrons—if you can analyze an electron; I am not quite sure about that. I cannot do anything of that kind; I appear before you, therefore, in a sort of helpless condition as far as any practical knowledge or advice is concerned. And yet I have always had something to do with chemistry—that is, since my early youth. The first symbolization of chemical action that I came in contact with was when, as a very small boy, I nearly blew my fingers off with a thundering, great big fire-cracker that had come into my possession. I suppose the chemists of that time had something to do with the concussion of that infernal stuff which came pretty nearly sending me out into life with a maimed thumb and forefinger.

Developing an Appreciation of Chemistry.

Then, I had a good deal to do with the early chemists of my boyhood days through the reading of ancient history, by means of which I got well acquainted with the old diviners and sorcerers and necromancers of dim and distant days. In my extreme youthfulness I enjoyed the tales of their wonderful divinations and performances. But there was always a mysterious and somewhat fearful side to that; I was never sure that in following them I was not in danger of going to the devil; it seemed to me that the father of all their secret machinations was the

*Address delivered before Ottawa Branch of Society of Chemical Industry at inaugural dinner, Chateau Laurier.

deity at whose shrine they worshipped and from whom they probably derived their arts and their powers of deceiving, frightening or killing people, as the case might be.

I remember reading after that, along in the course of history, of the alchemists, that wonderful set of men who were always striving for two things. One of these was to find out the elixer of life; to make it a practical thing for youth never to grow old and old age never to cause the serious accident of a departure from this world's existence. They were after the elixer of life—and the world would have been an awfully sorry world if ever they had found it and all of us were condemned to live forever on this sub-plane of existence. Then, they were after the philosopher's stone—the thing which, if I remember rightly, was to turn all the baser metals into gold and to make its possessor, and ultimately all people, infinitely rich. Had they been successful I suppose that we should now have no iron, no steel, no other like metals; all would have been transmuted into gold. We would, in a literal sense, have been living in the golden age, but all of us would have been starved to death long ago had that been the case.

The Chemist's Family Tree.

Following the form of the old Biblical chronicle which gives the genealogy of people, I suppose I would not be far wrong if I said that the modern chemist is the son of the alchemist, who is the son of the old diviner or soothsayer, who is the son of the evil one. That is the line of descent from which you have come. Well, don't be discouraged by that. A great many philosophers have made us all out to be descendants of the monkey. Of the two I am not sure that I would not rather take the superior intelligence as an ancestor, even if he was a rather bad one.

Now, having given you your descent in the genealogical line, let me express the hope that you have abandoned the secrecy and the wickedness of the old diviner and necromancer; that you have abandoned the wild ideas and over optimism of the alchemists and that you have settled down at last on the plane of pure truth and scientific knowledge and their practical application. After all, however, I am not sure that all these classes that I have mentioned and all the intermediate classes which came between them did not, in their search for certain things that they never found, turn up a great many things which subsequently became useful to the world. They turned over the soil, did the first exploration, made the surface trenching which has resulted in bringing about an age of analysis, of examination, of scientific testing; an age of getting at the deep-laid laws of nature and the ingredients and formations of substances, their qualities and their processes, and the manner in which these can be put to the best practical use. Whatever pursuit a man may earnestly engage in, however wild it may be in theory, he may either take up himself or reveal to others who are by his side some things which are of great benefit; some things which are like seeds that afterwards bring about a bountiful harvest of the better and the more practical and the more scientific.

Chemistry in Modern Agriculture.

Take, for instance, agriculture, the old, primal industry of the world. For thousands of years the farmer has farmed and the world has lived through his farming. During the most of those years the farmer used material, the laws and properties and qualities and tendencies of which he had no scientific knowledge whatever. He planted as his fathers planted. If he was as good a man as or a better man than his father, he observed things during his planting and effected improvements according to his observations. His observations, however, were only those of sight, of touch, of the senses. Yet he farmed, and the world lived. I suppose it is not much more than half a century ago that science was first applied to the farming industry and became its helper and subsidiary. Within the short time that has since elapsed, observe how everything has improved, how everything has speeded, how everything has gone ahead, until to-day the intelligent farmer is on the high road to the greatest success in his profession. Over the things with which the farmer had been dealing from the earliest period without knowing their qualities or being able to direct their tendencies, he now has full mastery because of the application of this scientific knowledge. Farming owes, and in the future will owe, the greatest part of its success to this released, helping force which has been brought to the hand of the agriculturist—this scientific knowledge deduced by patient examination, testing, analysis and synthesis. So that the oldest of the professions or occupations of the world, linked up, as it has been, with this new helpmeet and subsidiary, has before it in the future the achievement of its greatest conquests and its greatest progress.

Chemistry Basic to Progress of Civilization.

In these later years particularly, chemistry has revolutionized industrial processes and industrial methods. We have passed through the age of stone and through the age of iron, but it is only lately that we have come to the real iron and steel age, in which improved processes and methods have brought about amazing development in connection with the industrial enterprises which are engaged in production of various kinds. And we do not know where we are now. Out of iron comes steel, and steel processes which twenty years ago men did not dream of are now in active operation, developing the metalliferous resources of the world. Since earliest times we have been treading on banks of clay, but only within recent years have we come to find out the uses to which aluminum, for instance, can be put. We are now looking forward to an age in which aluminum will, in a great many things, take the place of steel and in which its different qualities will make a revolution in the manufacture of things necessary to the comfort and progress of the world. Here we get an idea of what chemistry has done so far as industrial processes are concerned. Of course, this is not news to any of you; I am simply trying to make a little sketch the application of which I shall bring out later.

Chemistry, however, has done more than link itself up with agriculture and with industrial processes. Chemistry has done things for the benefit of what is other than material. How many of the safeguards and comforts of life, which we enjoy to-day but which were unknown to our forefathers, are available to us because chemistry has done its work; has found out certain laws, processes, antidotes, alleviations—whatever you may call them? What an effect chemistry has had upon conditions in respect to pests, pestilent breeding places, alleviation of pain, processes of medicine and of surgery, the devising of antidotes, the working out of counteracting agencies to others of a harmful nature. Take, for instance, that prodigy of work, the building of the Panama Canal. Repeatedly this enterprise was undertaken, but always nature was too strong for the efforts of man. But at last that tremendous work was completed, and the achievement was made possible because of the purification of the isthmus from the deadly poisons

and the unhealthy surroundings which rendered it almost impossible for human life to bear the strain of long continued work. That shows what can be accomplished by the patient analysis, the careful examination and the thorough testing incidental to chemical work so far as concerns the purification of atmosphere and of surroundings which are deadly or dangerous to human life. The city of Havana is another instance of that kind; but there are instances everywhere.

Perhaps it is because people are busier than they used to be, but it is true that we seem to forget—we cannot keep in mind—all the things that have been accomplished in this line. Every once in a while we come up against something in connection with which we remember that in such and such a year there was an intimation or announcement of that, but it had gone out of our minds. But the work has gone on, spreading its life-saving and healing power every year throughout many countries. When we come to reflect upon the matter and to look into it—may be with the aid of a good library—we are amazed at the improvements which have been effected and which have received their impetus from the work of the patient analyst and investigator, out of whose activities have come these practical applications which have added not only to the health and comfort of the people, but also to the lifetime of the world. So that individually, socially, from a community and a national point of view, chemistry has bestowed a great benefit upon the human race. You may sum up the progress that has thus been made; you can see what the world owes to those patient, unostentatious people who have been working in laboratories day and night, unknown to the community generally, scoffed at by the practical man, sneered at by the man who is enjoying life, looked upon as hermits digging into impossibilities. But these men have been justified to this generation and will be justified to posterity. Out of their quiet, tireless work there have come great blessings to humanity.

New Sources of Power.

The world has an odd way of surprising us every once in a while. When one of our resources shows signs of being well worked out, there suddenly looms up into sight from this very same category of work a property or a resource of which we had known nothing before. As one thing begins to show signs of diminution, something else is brought out; and the world to-day is just about as rich in comparison with what is hereafter to be developed as it is in comparison with the days of two or three thousand years ago. The patient digger has yet incentives to carry on his work. The age that is directly before us is, to my mind, to be the most prolific, the most productive of remarkable developments, than is the age which has preceded it—perhaps than any age which has come before—to this army of chemists, of patient analyzers who investigate the qualities of things, the laws that govern them and the combinations and effects that may result from them.

Results of Business Divorced From Nationality.

We have just gone through a war. That war has been, as we all know, the most terrible, in all its aspects, of any war that the world has seen. We owe it no gratitude for the men it has slain, for those whom it has robbed of their loved ones; for the diseases it has engendered, for the poverty it has brought about, for the long line of horrible consequences which will follow it through this generation and the next generation and many generations yet to come. We hate it for all that; but once in a while we can extract a sunbeam from the cucumber and we can find some compensation even amidst all the horrible debris left by the war. War showed us that we had divorced business from nationality. Now, my theory is that business should not be divorced from nationality. It is all very well to say that a commercial man in the British Empire should care not a continental for anything else; that he should make as much, sell as much and profit as much as he possibly can, with supreme disregard of the nationality which has given him his home, which protects him and his children and his children's children. True, the commercial man has an absolute right to carry on his business, conduct his processes, make his sales and receive his profits within all reasonable and proper bounds. But he owes a fealty to the nation which protects him and within the borders of which he carries on his activities. Before the war a commercial man would say to you: "Yes, we discovered some processes in Great Britain; but realizing that the German is a man of infinite patience and detail, we let him take those processes, and after he perfects them and acquires a monopoly of them, we buy them from him, making money in some other way to pay for what we receive." So some of the most valuable inventions and processes which were discovered in Great Britain went over to Germany, under that commercialized idea of business. But subsequently there was trouble. The national boundaries became things which you could not cross with your dollars and your rubies and your other money significations. Then it was that the Empire found that that idea of nationalized commercialism was likely to wreck it. Germany had the monopoly in respect of things that were vital and necessary to the defence of Great Britain in time of war, and years were added to the war, hundreds of thousands to the dead, and billions of dollars to the national expenditures, because we had forgotten that the commercial man within the nation owed something to the nation itself. What he owed in this case was to see to it that these vital processes—vital to the nation's existence and to the development of its resources—were kept within the borders of his own land. Well, we have learned the lesson—and it was a bitter lesson to learn. But I do not think that the lesson will be unlearned; and that is something that the war has given us.

But it gave us something besides that. When I was over in England one of the British Ministers told me that when the first army that Britain sent over to France came to be overhauled and equipped, it was found that one of the articles used in that equipment was controlled by a monopoly in the hands of Germany and that in not a single factory in Great Britain could that article be made. Well, that was a startling lesson. What I mean to say is this: that our weakness and our bad policy was shown to us by the war. But the moment that came to be understood, the British people set themselves to work and replaced, so far as they could, what had been lost to the enemy in that respect. But, as I have said, what precious time was lost and what precious lives were sacrificed before what had been lost was regained. The resources, the skill, the inventive genius of the British people under the stress of war equalled and surpassed anything of that kind that had been seen in the German Empire. We learned the fallacy of what we had been teaching ourselves for many years—that the Germans were superior to the British people in this, that and the other thing. The fact of the matter is that they were not; they were simply allowed to get possession of these things and build up monopolies in them. But the resource, the skill, the in-

ventive genius of the British people developed during the period of war; so that we have not only been shown our weakness; we have also been impressed by the fact that we have within the Empire resources and genius and skill equal to those found in any other country of the world. So that these lessons we may apply to the peace conditions which have followed the war. We shall be very foolish and silly people if we ever unlearn them or ever forget to put them to their proper uses.

The war has entailed upon us tremendous expenditures and very heavy burdens. We have splendidly gone through six loans in Canada, but we are not at the end of our burdens, by any means. The hard days are all ahead of us; we might just as well make up our minds to that now. The hard days are not behind us, except in the fact that we hope there will not be much more blood-letting. We must renew the waste, the incalculable waste that has resulted from the war—waste not only of material, but of human fibre. Millions of the strongest and best of the races have been left *hors de combat*—completely disabled, partly disabled, maimed, confused in mind and body. I tell you that no pen can truly depict the awful degradation of power, physical, moral and mental, that the war has brought about. It is not too much to say that the world has been set back a good many years in that respect—how many years may depend upon the amount of thought that we give to the matter.

Produce and Save.

You hear the slogan everywhere, "Produce and Save." Produce, that is, not only what you need for yourself, but produce to sell; because if we do not produce to sell to people outside our own country how are we going to adjust the balance of trade? How get our exchanges into shape? How pay our debts and our obligations? We must produce, therefore, not only for the eight millions of Canada, but also for eight millions outside of Canada, so that our surplus products will be the means of bringing money from abroad, enabling us to meet our obligations and maintain a proper balance of trade and international commercial exchange.

Then, there is that which is almost, though not quite as important as production—saving. By doing without anything that is not fairly necessary for good living and saving all the rest, thus enabling the shipment of that surplus to other countries for the purposes which I have explained, we go a long way towards accomplishing the very necessary work of reconstruction. These two essentials must, then, be conjoined together—save, and produce.

The Waste in Canada.

Now, the lesson we should add to that is simply this. With the exception of the United States, which is a wasteful country, too, Canada is probably one of the most wasteful countries in the world. Our people have been so few to pieces. Now, that is a striking example, but that is the way we begin. I was brought up on a farm. My father had bought what was called a new farm; it was studded with rock maple, white maple, yellow birch and white birch. I will tell you what we did on that farm—and I have a very vivid recollection of it, because I piled what they called black fallow on that farm. Perhaps you who live in the city do not know what that means. Well, you go into this forest of birch and maple and you cut down ten acres of it. Your old family fireplace will take a certain amount of that for the winter's burning, and may be you will be able to sell a few cart-loads here and there. As a rule, however, other people have just as much as you have and there are not many to buy; market conditions then were not what they are now. The remainder that you cannot use is piled up in large heaps, left there through the winter, gets the spring and summer suns upon it, and during the summer the whole thing is set fire to and burned off—brush, wood, everything. What remains after the fire has raged through the heaps is as black as the ace of spades. Piling black fallow means going into that and piling it up with your hands into subheaps, and then setting fire to those. You go out in the morning well washed and clean; you come back looking like a man who has been through a soot bin.

Well, there is an example of the waste that has gone on in our country. Some of the waste could not, in those early days, have been avoided; but the same spirit of waste has gone on through the whole of the forest production of this country. How much of the lumber that is felled is left where it falls and allowed to go to waste? Now, this is where chemistry comes in. Material in connection with our great industries—timber, coal, fisheries—is rotting in our fields and forests, running to our rivers, turned up by the fires; and with the assistance of the chemist much of this material can be put to good use. There is one great field that is open to us. Necessity will compel us to husband our resources, if only for the mere sake of commercialism itself. But again I say that there is something higher than mere commercialism. After all who are now living on this earth pass away another generation will require resources to live upon; therefore you are a conscienceless man, you are a thoughtless man, you are a heartless man if for the sake of making profit you care not whether you take the last fish that is in the lake, the last tree that is in the forest, the last piece of coal that is in the mine. You must remember that people are to come after you; that such control must be exercised and such methods adopted as will ensure to future generations a chance to exist within the bounds of our country. And by the conservation of the old things and the finding out and proper application of the new, you can make it pretty sure that no matter what the population of this country may be in the future there will always be ample for its subsistence.

There are certain things which, if exhausted, cannot be replaced. You cannot make coal again; it requires too much time. It is like the soldier who wants his gratuity now; he doesn't want to wait for it until later. It is like the civil servant who wants his bonus now, at Christmas time, and cannot afford to wait. It is like you, Mr. Chairman, who want the reclassification right, and that now. But I say that there are some things which you cannot replace, and coal is one. Coal can be conserved, and used as a national asset as well. But that is the extreme case; there are other things that do not perish in the use thereof. Take agriculture. The lands of this country should become richer the more they are tilled. For instance, you export one hundred million bushels of wheat. You send that away to Europe, and you get a good price for it. You have completed your transaction; have you transported anything except grain? Now, there is a question to answer. You have exported some of the vital foods of the land upon which that grain was raised; and if you go on exporting similarly year after year, you will have to turn round bye and bye and purchase back at great cost fertilizers to replace that food value that you exported. And when you figure it on a basis of fifty years, you will find that your exporting has not been as profit-

able as you might have thought. However, the point I wish to make is this: agriculture can be so carried on that the land will become richer year by year. With all our scientific and experimental knowledge, this country ought to see to it that the lands of Canada shall not become a failing asset, but that they shall rather become a constantly growing asset so far as fertility and power to reproduce is concerned. There chemistry comes in and performs its work. As this scientific knowledge filters into the minds of the farmers and of the people generally, the benefits will become apparent and the soils that are cultivated will have increased fertility and productiveness. This, then, is one of the resources that you can keep.

Take your fisheries. Why should you not have an interest upon capital in the way of fisheries and not allow that capital to be diminished? You can do it by employing proper methods of fishing and by utilizing everything that you take out of the sea in the way of subsidiary products. You will have a greater yearly output, and by carefully observing the proper methods of fishing and looking also to reproduction, your fisheries will not diminish with increase of population, but will be sufficient for all purposes and will at the same time afford an interest upon your preserved capital for foreign account. So that you can divide our resources into these two classes: those which are perishable, and those which may be maintained always if we deal with them in the right way.

There never was a golden age for the chemist and the scientist comparable to this, so far as the application of these truths to agricultural pursuits is concerned. And when I use the word "agriculture," I include stock as well, the very same thing is true of stock. All of you who are around these tables know what improvements have been made in the feeding and breeding of stock and all that pertains thereto by the employment of scientific methods, thus improving the standards, increasing the production, and enhancing the value of one of the world's great resources.

My time is up and my car is waiting. That is all I am going to say to you to-night.

Ottawa, Dec. 18, 1919.

OBITUARY

PROFESSOR EBEN. MACKAY.

The death from pneumonia at Halifax, on the night of January 6th, of Dr. Eben Mackay, Professor of Chemistry at Dalhousie University, removed an outstanding figure from the ranks of Canadian men of science and caused what seems an almost irreparable loss to Dalhousie University, where, for the past 24 years, he has been identified with the teaching of chemistry. He was taken ill on December 29th, and was removed to the hospital the following day. After a gallant fight for life he passed away after only a few weeks illness.

To Dalhousie University, which was also his Alma Mater, having graduated there with first-class honors in 1886, he gave almost a quarter of a century of devoted, faithful and ever progressive service. Born in 1864 at Plainfield, Pictou County, Nova Scotia, of Scotch parentage, he received his first education at the famous Pictou Academy, and ranks high among the distinguished sons of that institution. Following matriculation from the Academy, he came to Dalhousie and was awarded his Bachelor of Arts with first-class honors in 1886, receiving also the Mackenzie Gold Medal. From 1886 to 1892 he was principal of the New Glasgow High School, leaving that position to undertake special studies in chemistry, his chosen field, at Harvard and at Princeton. In 1896 he obtained his Ph.D. at Johns Hopkins and came to Dalhousie as MacLeod Professor of Chemistry and Mineralogy.

The service he performed the college and the student body during his twenty-four years occupancy of the Chair of Chemistry cannot be valued. It has been "beyond any price or valuation." He was one of the group of professors who have succeeded in placing Dalhousie University in the top rank of educational institutions. As a citizen of Halifax his loss will be felt keenly. He displayed keen interest and civic pride to a high degree. He was a prominent

The Late Dr. Ebenezer Mackay.

member of the North British Society, and in 1918-1919 was first Vice-President of that body. He was devoted to the church of his fathers, the Presbyterian, and was an active member of St. Matthews' congregation, from which church the funeral was held on January 8th. Dr. Mackay was unmarried and is survived by two brothers, Professor Henry M. Mackay of McGill University and Mr. J. D. Mackay of Truro, N.S.

Perhaps we cannot do better than to quote from a tribute to Dr. Mackay from Dr. Archibald MacMechan, Professor of English at Dalhousie, one of his closest friends:

"It has been the singular lot of Dalhousie to enlist in its service men of outstanding ability and character, who devoted themelves with their whole heart to the good of the college, and not their own. Never had the institution a more leal-hearted, more unselfish servant than "Eben" Mackay. He was the new type of professor, always learning his subject, and therefore a fresh and clear imparter of his learning. He never spared himself. The work of a professor of natural science who employs the laboratory method, is most exacting. It means personal attention and superintendence of the students' work, and attention to endless detail. Every one who ever took Chemistry in Dalhousie will testify to Mackay's thoroughness, his justice, his patience, his native and inexhaustible courtesy. About his courses there could be no sham; he was too

real himself. He made specialists in his subject, and he impressed on hundreds of the rank and file his own clear, clean way of thinking, his own practice of scientific method, and his vision of Law swaying the wondrous constitution of the universe.

WALTER LAWTON IVESON.

On February 3rd, Walter Lawton Iveson, M.A., Lecturer in Chemistry, Ontario Agricultural College, Guelph, Ont., passed away, following an attack of pneumonia. He was only in his 30th year, and was the son of Mr. and Mrs. Frank Iveson, of Metcalf, Ont., where he was born. He received his education at McMaster University, Toronto, research work. E. C. Young, M.A., Arts '16, a demonand prior to his appointment at Guelph was with the Civil Service at Ottawa. He is survived by his wife, formerly Miss Eileen Hoover, of Guelph, his parents, one brother and four sisters, to all of whom sincere sympathy will be extended.

CHEMICAL SOCIETY NEWS.

Montreal Branch Society of Chemical Industry.

Good progress and live meetings have been in order during the season at Montreal. With Mr. Job as chairman, a good series of meetings has been worked out. Looking over the programme in review, it may be noted that industrial matters of first importance have been dealt with. In October, an address was given by Mr. Kynock of "The Methods of Wood and Tie Preservation." The growing importance of preserving the life of our woods and timber is extremely urgent. With ordinary ties from 70c to $1.00 at the shipping point, it is a matter of moment to railway companies. In general, according to Mr. Kynock, a good commercial preservative must be: (1) Toxic to action of fungi. (2) Capable of properly penetrating the wood. (3) Permanent in effect. (4) Capable of taking paint. (5) Inactive on iron and steel. For ties penetration should not be less than three-quarters of an inch.

In November "The Zinc and Lead Deposits of Gaspe" were discussed, Mr. Alexander Gray reading Mr. Beidleman's paper. Discoveries were made in 1909, but in 1915 systematic development commenced. Geological reports by Prof. Mailhiot (Ecole Polytechnique) and Dr. A. P. Coleman, of the University of Toronto, demonstrated that these ores were free from iron and of high grade, fully equal to those in Missouri at Joplin. The sphalerite in the 50 acres developed gave a zinc content from 62 per cent. to 65 per cent., with less than 1-2 per cent. iron.
the teaching of English to technical men at universities and colleges, and pointed out the necessity of mastering the language completely in order that no handicap may follow the student into commercial life.

On January 23rd, Mr. C. F. Bardorf, of the St. Lawrence Sugar Refineries, delivered a paper on "Notes on Decolorizing Blacks." This followed an informal dinner. In all probability the Montreal branch will hold a meeting about May 1st at Shawinigan Falls.

Ottawa Branch.

On January 22nd, a most important paper by Mr. L. W. Bates, on the very important subject of "Colloidal Fuels" was presented. This will appear in full in this Journal. In this connection, it was shown that Mr. R. C. Cantelo, of the Fuel Testing Division of the Mines Branch, successfully carried to conclusion some preliminary investigations to ascertain whether or not carbonized lignite could be employed as a stabilizer. This was done with some success.

Toronto Branch.

On January 22nd, at the usual monthly meeting and dinner, Mr. David Gilmour, C.B.E., President of the Standard Chemical Co., gave a most exhaustive survey of the design and operation of the very large explosive works erected at Gretna, England. This plant extended around this historic site and was in all some nine miles long and two miles wide, and represented an expenditure of about $50,000,000. It was designed and put in operation in the period of one year. Mr. Gilmour told of the problems that were met with, the building of towns for the 30,000 workers, the gathering of machinery and the erection of plant. Complete acid and nitrating plants of very great capacity were erected, with the assistance of all manufacturers, who gave their best ideas and some of their best men to this Government work. In many ways, the whole plant demonstrated that efficiency of the highest order applied to most complicated work could be obtained by men drawn from all parts of the world, and girls who had never previously even casually observed the operation of such machinery.

Mr. Gilmour, after giving a very detailed description of operations in technical language, pointed out that by manufacturing on such a large scale they were able to reduce costs to an extent not thought possible, even with pre-war prices. The idea that the English way is to blunder through to success must give place to the conception that the English method is to attain efficiency, and then success must follow.

Where every operation went forward with an element of risk and danger, it is remarkable that only two lives were lost during the whole history of the plant. The large part played by Mr. Gilmour in managing operations of this nature makes his coming to Canada a guarantee of chemical progress, and his presence a great help to the general advancement of the Society of Chemical Industry.

TORONTO RUBBER SECTION MEETS.

On Friday evening, January 30th, at the Engineers' Club, Toronto, a most successful meeting of the Rubber Section of the Toronto Branch of the Society of Chemical Industry was held. Thirty members of the section sat down to the informal dinner at 6.30 ,and when the speaker of the evening, Mr. C. W. Drake, of the Westinghouse Company's Engineering Department, Pittsburgh, Pa., commenced his address an interested audience of forty were present, a fact which speaks well for the future of the Rubber Section and amply demonstrates the justification of the organizing of such technical groups as the Rubber, Paint and Varnish, etc.

Among those present were noticed many superintendents, managers and mechanical superintendents of local rubber plants. Following the dinner, Mr. D. H. Huether, of the Dunlop Tire and Rubber Company, convenor of the section, called on Professor E. G. R. Ardagh, chairman of the Toronto Branch of the Society of Chemical Industry, for a few remarks relative to the society and the different technical groups. Professor Ardagh explained why such groups had been formed, stating that at the group meetings papers of interest to that particular industry would be given and discussions carried on, while at the monthly general meeting of the society all the groups would unite to hear addresses and take part in discussions on subjects of general interest, in which even one with a very limited interest in chemistry could hear something that would be of interest and profit to him. He urged every member of the different groups to become at least an associate member of the Society of Chemical Industry, where, for

the nominal fee of two dollars per annum, they could enjoy all the advantages of the meetings.

Mr. Huether then introduced Mr. Drake, who gave a splendid paper on "Electrical Applications to the Rubber Industry." Mr. Drake covered his subject thoroughly, describing the appliances generally used and new equipment being tried out. After the paper an interesting series of lantern view were shown of different types of installations for both large and small rubber plants. One could not fail but be impressed with the close connection of electricity to the rubber industry.

The next meeting of the Rubber Section will be held on February 20th, at which Mr. Wieganed, director of manufacturing, Ames, Holden & McCready, Limited, will give an address on "The Physics of the Rubber Stress Curve." At the March meeting, date not yet arranged, Mr. J. P. Devine, of the J. P. Devine Company, Buffalo, will speak on "Rubber Dyeing." Both these meetings should prove very interesting.

MEETING OF PACKING HOUSE CHEMISTS.

Under the direction of H. D. Tefft, of the Harris Abattoir Co., Ltd., and a committee of chemists from the packing house and glue companies of Toronto, consisting of Messrs. L. T. Acton, H. E. Rothwell, J. R. Donald and J. Harris, a programme of technical meetings has been arranged.

The first of these was held on January 14th, and was addressed by Professor L. M. Arkley, of the University of Toronto. The subject taken was "Power," and a very practical review of boiler plant problems was given. Special reference was made to these problems as they affect packing houses and similar plants, and it was ably demonstrated that much money might be saved by the application of thought to the design and operation of the boiler room. Few places around the plant offered such possibilities for saving, while at the same time the problems connected were complex and could only be worked out in connection with the general economy of the operations being carried on.

Further meetings will be held, when papers on refrigeration and soap manufacture will be given. Engineers and others interested are invited to communicate with Mr. Tefft regarding the work of this branch of the Toronto section of the Society of Chemical Industry.

PERSONAL.

Mr. H. P. Hird, Chemical Engineer, of Dewsbury, England, and the inventor of the Hird Continuous Tar Distillation Process, recently spent a few days in Hamilton and Toronto. Mr. Hird has made an extended business trip through the United States and is returning to England shortly.

Mr. C. S. Hawkings, of the staff of the Laboratory of the Dominion Department of Health, Ottawa, has resigned and taken a position with Price Brothers, Kenogami.

Mr. G. P. Ham, of Toronto, has taken a position on the staff of the Standard Chemical Company, and will be stationed at their plant at Longford, Ontario.

Mr. R. M. Rowat, a graduate of McGill University, formerly with the Dominion Government Food and Drug Laboratories, has taken a position on the technical staff of the Canadian Packing Company, Ltd., Toronto, and will direct the work of their chemical laboratories.

Several McGill University men are engaged in important strator in Chemistry, who last July was awarded the fellowship of the Honorary Advisory Council for Research, is doing research work at Cambridge University, England, in Biological Chemistry under Professor Gowland Hopkins. Mr. Young was very active in research work at McGill with Dr. Harding. John Russell, M.Sc., who was awarded the 1851 Scholarship, is carrying on research under Dr. Theodore Richards in Physical Chemistry at Harvard University. O. W. Hertzberg, M.A., Arts '17, is engaged in the research laboratory of the Shawinigan Water and Power Company, Shawinigan Falls, under the directorship of Dr. F. S. Skirrow, formerly Assistant Professor of Chemistry at McGill. Dr. Skirrow's place at McGill was filled by Dr. F. M. G. Johnson, Science '04. Dr. Otto Maass, Arts '11, formerly lecturer in the Chemistry Department, who obtained his Ph.D. degree from Harvard, is now assistant professor at McGill, having charge of the Physical Chemistry.

BOOK REVIEWS

SOLUBILITIES OF INORGANIC AND ORGANIC COMPOUNDS.

By Atherton Seidell. Revised Second Edition, 1919. D. Van Nostrand Co., New York. 821 pages. $7.50 net.

Any standard work such as this needs only to be mentioned to be appreciated by chemists. The patient care required in the preparation of tables is something which English-speaking peoples should cultivate, and it is greatly to be desired that more co-operation in future will allow more often the work of a complete organization to appear under one cover, whenever the subjects treated are obviously beyond the limits of any individual.

Scientific men must remain indebted to individuals who have prepared for their service such standard works as the one under review. Most chemists are already familiar with a previous edition of this book, and may rest assured that the period since 1911 has allowed the author to gather much new data. In particular, freezing-point data has been added.

Following the detailed information regarding chemical individuals, a chapter is given on methods for the determination of solubility. Here the various regular means and accounts of several more unusual or specially designed methods are quoted, all well illustrated with drawings of apparatus.

Solubility is a matter of such general industrial importance, and problems demanding exact data are so continually before investigators, that such a reference is a necessity. Generalizations in this field of chemistry can only follow after such complete surveys are made available.

THE REALITIES OF MODERN SCIENCE.

By John Mills. The Macmillan Co., New York. 327 pages. $2.50.

Having in mind that high school and college courses have not introduced our best-informed citizens, who were pupils a few years ago, to the most recent advances in science, the author has tried to supply a deficiency, and, in short, bring their general fund of information to date.

The type of book is very commendable, as there are in the world to-day vast numbers of middle-class science minds not conversant with some most fundamental discoveries, and who never had a real opportunity to obtain any appreciation of the trends of modern research.

The general properties of matter are explained, and some very readable chapters are presented, in which the significance of modern conceptions regarding energy, matter, force, electronic and molecular magnitudes, are well developed and explained, from the viewpoint of the requirements of the well-informed individual interested in science.

INDUSTRIAL SECTION

Construction, Manufacturing and Market News

COMPARISON BETWEEN MONO APPARATUS AND OTHER INSTRUMENTS USED TO CONTROL THE BURNING OF FUEL IN A BOILER PLANT.

By G. HALLBERY.

The instruments in use for this purpose are:—balance, water meter, draught gauge, thermometers and recorders of flue gases. Experience with Mono-apparatus has shown that few understand the use and recording capacity of these different instruments. What follows is explanatory information in this connection.

One distinguishes two different methods of measuring the utilization of the fuel, viz.:

1. The direct method. 2. The indirect method.

Direct Measurement of Heating Value.

When using the direct method the quantity of heat utilized is ascertained by establishing the heating value of the fuel, by weighing or measuring the fuel consumed and by measuring the water evaporated.

This method is employed when the efficiency of a boiler is to be ascertained exactly by means of a short test, which is carefully watched. An analytical determination of the heating value of the fuel employed must always precede this test, as the nature of the fuel or its heating value vary from day to day, and as the determination of the heating value is an operation costly and time-consuming, the direct method in this form never can be employed for continual control. For this purpose the quantity of evaporated water in pounds per pound of fuel consumed must be measured, in order to obtain an approximate measure of the utilization of fuel in the entire plant. Furthermore, a quite reliable water meter for hot water running forth intermittenty has not yet been brought into the market, and the registered quantities of evaporated water are in most cases very unreliable. Finally such a controlling procedure, even in the best case, can only indicate whether the whole boiler plant has been working with good or poor tion of the fuel, but serves more for estimating the production of steam and the load of the boilers than for obtaining an effective measure of the heating efficiency.

The manner of employment and the capacity of the two instruments, the balance and the water meter, which are used in this controlling procedure, may thus be considered at their real value and in their place.

Indirect Measurement of Heat.

When using the indirect method of ascertaining the utilization of the fuel, the losses of heat are determined and the remaining quantity must then be the quantity of heat utilized. Of the losses of heat which may appear in a boiler plant, the so-called chimney losses, not counting quite exceptional cases, play the most important role, and therefore the indirect method has been limitd in practical use to the end that these losses become as insignificant as possible.

The cause of the so-called chimney losses is partly that the flue gases are hot when passing to the chimney, and partly that the flue gases may contain combustible gases, which go away through the chimney without having been burnt.

In order to reduce the chimney losses as much as possible the fuel must be entirely consumed with the lowest possible quantity of air, and the heat of the flue gases must be utilized in such a way that they pass to the chimney at the lowest possible temperature. In this manner the loss of combustible gases is avoided, and the loss of heat in the hot flue gases passing away becomes as insignificant as possible, owing to the small quantity and the low temperature of the flue gases.

The chimney losses are consequently determined by:—1. The quantity of flue gases. 2. The percentage of combustible gases in the flue gases. 3. The temperature of the flue gases.

In one, and the same boiler the first two factors depend on the fireman's work, while the temperature of the flue gases under similar conditions depends on the load of the boilers. The determination of all three factors is necessary for establishing the chimney losses. But only the two first factors can show if the fire has been treated economically.

The best executed draught gauges are of the so-called differential type, which indicate the difference of draught underneath the grate of the boiler and before the damper, thus measuring the resistance, which the flue gases meet with during their passage through the boiler. It is evident that the greater the air supply and the greater the quantity of flue gases hereby produced, the greater also the resistance and vice versa, presuming that the other factors, which may be taken into consideration in this respect, are quite the same. But to draw from this the conclusion, on which the employment of the differential draught gauge is based, that a certain difference of draught corresponds to a certain air supply, is decidedly a mistake, because this resistance varies simultaneously with the height of the layer of fuel, with the size of the fuel, and, above all, with the slag conditions. The draught gauge is therefore a very imperfect instrument for measuring the quantity of air admitted to the combustion chamber and the quantity of smoke gas produced. Added to this, nothing is learned as to whether the air supply is sufficient or in excess of that necessary for complete combustion.

As to the thermometer, it may be pointed out that single temperature observations on the flue gases are entirely worthless because the temperature of the flue gases varies with the load as well as with the quantity of air admitted to the fire through air leakage. The thermometer therefore will be of importance only when the quantity of flue gases is recorded. This, taken along with temperature observations, will give an exact estimation of the losses of heat in the hot flue gases. Thus the thermometer can be usefully employed to learn whether the boiler is loaded economically.

As is well known the composition of the gases may be recorded by analysis. The percentage of carbon dioxide, carbon monoxide and oxygen, or the ratio of non-combustible gases in the flue may be continuously measured and a reliable control kept of the efficiency of combustion.

The distinctive feature of Mono Apparatus is that it controls and relates these two types of necessary information working continuously and automatically.

From Technical Department, Pulp and Paper Mill Accessories, Ltd., Montreal Que.

MINERAL OUTPUT OF BRITISH COLUMBIA IN 1919.

By F. H. Mason.

The preliminary review and estimate of the mineral production of British Columbia in 1919 was laid on the table of the House at the opening session of the Legislature, on January 29, by the Hon. William Sloan, Minister of Mines. A number of estimates had been published in different mining periodicals, but these, as will be seen by comparison with the official figures given below, were in many cases wide of the mark and the Province may have suffered injury from their premature publication. The production of lead, for example, one mining periodical gave as 17,804,470 lb., while the official figure is 32,134,136, or nearly double the figure published. The above are the official figures. The production in 1918 is given side by side with that of last year, for the object of comparison:

	Production, 1918. Quality.	Value.	Estimated Production, 1919. Quantity.	Value.	Increase.	Decrease.
Gold, placer ..... oz.	16,000	$ 320,000	14,325	$ 286,500	.....	$ 33,500
Gold, lode ..... oz.	164,674	3,403,812	141,769	2,930,365	.....	473,447
Total gold	.....	$ 3,723,812	.....	$ 3,216,865	.....	506,947
Silver ..... oz.	3,498,172	3,215,870	3,667,516	3,871,063	$655,193	.....
Lead ..... lb.	43,899,661	2,928,107	32,134,136	1,658,121	.....	1,269,986
Copper ..... lb.	61,483,754	15,143,449	45,984,046	8,631,205	.....	6,512,244
Zinc ..... lb.	41,772,916	2,899,040	43,694,583	2,717,803	.....	181,237
Total metalliferous	.....	$27,910,278	.....	$20,095,057	.....	7,815,221
Coal ..... tons, 2,240 lb.	2,302,245	$11,511,225	2,357,218	$11,786,090	274,865	.....
Coke ..... tons, 2,240 lb.	188,967	1,322,769	98,598	690,186	.....	632,583
Total collieries	.....	$12,833,994	.....	$12,476,276	.....	357,718
Miscellaneous and building material	.....	$ 1,138,202	.....	$ 850,000	.....	188,202
Total production	.....	$41,782,474	.....	$33,421,333	.....	$8,361,141

It will be seen that there was a decrease in the value of the production of all metals and minerals, as compared with the previous year, except silver and coal, and there was a decrease in the actual production of all metals and minerals, except silver, zinc, and coal. The total decrease of $8,361,141 in the value of the mineral production, a decrease common to the other Provinces and to most countries, is due mainly to the great decrease in the quantity of copper and lead produced, and to the decrease in the ruling prices of those metals during the year. The main reason for the decreased production of those two metals will be clear to those who have followed the situation in the metal industries and the trend of events during the past year. After the signing of the armistice there was an anticipation of a sustained demand for metals in the wake of war, but, owing to political, financial, and, most of all, labor troubles, the demand did not materialize, consequently the producers were faced with the problem of disposing of an enormous surplus of metal. It is estimated by the United States Bureau of Mines that the big copper companies in that country had a supply of copper at the commencement of 1919 exceeding 1,500,000,000 lbs., and the Granby Consolidated M. S. & P. Co. and the Consolidated M. & S. Co.—in a much smaller way, of course, found themselves with huge stocks of metal that could not be disposed of, except at a great sacrifice. While the foregoing was the main reason for the decreased copper and lead production, local events played a part. A prolonged strike at the Crow's Nest Pass coal-fields and consequent shortage of coke was the means of closing the Phoenix mines and Grand Forks smelter of the Granby Company, six months earlier than the company intended to close them, and a fire at the converter house of the Granby Company's Anyox smelter reduced the production at that smelter considerably. A dissatisfaction with the schedule offered by the only lead smelter in the province was the cause of reducing the output at the mines during the first half of the year, when the schedule was amended, and since then production has materially increased.

Considering that in previous years most of the silver produced in the Province was obtained as a bye-product in the smelting of lead and copper ores, the increase in the production of silver last year is a matter for congratulation. The high price of the metal has been an incentive to the mining of silver-bearing ores, and a number of old mines have been reopened on this account; this, together with the opening of two important mines, the Premier, in the Salmon River district, and the Dolly Varden, in the Alice Arm district, are the principal reasons for the increase. The Dolly Varden produced 400,336 ounces of silver from 6,373 tons of ore during the five months that it was in operation. Unfortunately there is a cloud in the sky with regard to this mine, and the present indications are that it may once again be tied up by litigation.

Considering the long strike at the Crow's Nest Pass coalfield, which halved the coke production, the increase in the coal production is very satisfactory, and augurs for better things this year.

Looking to the future, the stock of metals held by the various smelting companies has been greatly reduced, and as the price of all base metals has been rising steadily since the beginning of last December, there is every reason to hope for a considerable increase in the mineral production this year. If the price of metals holds, there is no doubt about the production, as both the Granby and the Consolidated companies are in a position to materially increase their outputs of both mines and smelters should the demand for the metals warrant it. The Consolidated Company has solved the problem of the treatment of its Sullivan mine ores, and has erected a 600-ton concentrating plant at Trail, in which the ores will be treated during this year. The plant is really only an experimental one, and on the working of it will depend the nature of the big 10,000-ton plant that ultimately will be erected at the Sullivan mine. The ore is a mixture of zinc-blends, galena, and pyrrhotite, together with about 10 per cent. of gangue. The gangue is first removed by concentration on tables, the pyrrhotite is then removed by magnetic concentration, after which the blend is separated from the galena by preferential flotation. During the coming year the Consolidated Company will erect a big concentrator to handle its Rossland mines ores, and it will erect concentrators at the Old Sport mine and the Sunlock mine on Vancouver Island.

NEW YORK LETTER

Special Correspondence to the Canadian Chemical Journal by F. M. Turner, Jr.

New York, Feb. 1, 1920.

On Friday evening, January 16, the Perkin Medal of the New York section of the Society of Chemical Industry was presented to Dr. Charles F. Chandler, the Dean of American Chemists.

The Perkin Medal is given in recognition of notable contributions to the progress of the application of chemistry to industry. The present presentation is the fourteenth presentation that has been made, the previous medals having been awarded as follows: 1906, Sir W. H. Perkin; 1908, J. B. F. Herreshoff; 1909, Arno Behr; 1910, E. G. Acheson; 1911, Herman Frasch; 1913, James Gayley; 1914, John W. Hyatt; 1915, Edward Weston; 1916, L. H. Baekeland; 1917, Ernest Twitchell; 1918, A. J. Rossi; 1919, F. G. Cottrell.

The medal was founded in commemoration of the fiftieth anniversary of the founding of the coal tar industry and was named in honor of Sir W. H. Perkin, to whom the world is indebted for that great development.

Dr. Marston T. Bogert, of Columbia University, presented the medal, and in his address outlined the biography of Dr. Chandler. Dr. Chandler was born in New Bedford, Mass., and was educated at the Lawrence Scientific School and the Universities of Berlin and Goettingen. For over fifty years he has been engaged in the teaching of chemistry and in chemical research. Among his scientific contributions may be mentioned his work on the flash point of petroleum oils which facilitated immensely the safe and extensive utilization of kerosene as a domestic and industrial fuel; his standardization of 66 degrees sulphuric acid; his work of the Baume scale, etc. However, valuable as has been Dr. Chandler's work as a research worker in chemistry and as an adviser to the state and city, he will chiefly be remembered for the influence he has had on hundreds of successful chemists and chemical engineers as an educator.

Dr. M. C. Whitaker gave a delightful address, in which he touched with a good deal of humor on many incidents in his relations with Dr. Chandler, which have extended over a considerable period of years. Dr. Chandler's speech of acceptance was entirely impromptu and the more appreciated for that reason. Full of quiet humor and interesting allusions, Dr. Chandler's speech was the most significant item in the evening's programme.

The meeting took place at the Chemists' Club, and was preceded by the usual dinner, which was exceptionally well attended.

Nitrogen Fixation.

The process of nitrogen fixation developed by the General Chemical Co. during the war, and known as the De Jahn process, is to be developed commercially by a $5,000,000 New York corporation to be known as the Atmospheric Nitrogen Corporation. The Semet-Solvay Company, as well as the General Chemical Co., are interested in this development. The President of the new concern is to be Mr. R. L. Pierce, President of the Semet-Solvay Company; the Board of Directors will include as representatives of the parent concerns, besides Mr. Pierce, Mr. H. S. Handy, Mr. E. L. Miller, Mr. W. H. Nichols, Jr., and Mr. Henry Wigglesworth.

It is understood that the plant is to be erected in the vicinity of Syracuse, N.Y. The process is stated to be a great improvement on the German processes. For one thing, the very high pressure necessary in the German method, and a cause of great engineering difficulty, have been appreciably lowered. The company will sell ammonia, nitric acid and other nitrogen products, and will produce carbon dioxide as a by-product. It is expected that the initial plant will cost about $1,000,000.

Personal and Business Items.

Hemingway & Co., the corporation recently organized to take over the business of Frank Hemingway (Inc.), and other interests, has been sold to Sherwin-Williams Co., the well-known manufacturers of paints, colors, etc. Mr. Frank Hemingway, former President of Hemingway & Co., will remain with the Sherwin-Williams Co., in charge of their chemical development work. Mr. Hemingway is well known among chemists in New York and abroad. He has been for some time treasurer of the New York section of the Society of Chemical Industry, and is a member of the Chemists' Club, the American Chemical Society and various trade associations. His firm has been in existence many years, and a few years ago established a plant at Bound Brook, N.J., for the manufacture of synthetic chemicals.

Dr. Wilder D. Bancroft, Professor of Physical Chemistry at Cornell University, and temporarily with the National Research Council in Washington, was a visitor at the Chemists' Club, New York, recently. Dr. Bancroft has been presenting a series of lectures on "Contact Catalysis" at Wilmington, Del., under the auspices of the Delaware section of the American Chemical Society.

The Beckers plant of the National Aniline and Chemical Company, in Brooklyn, has been disposed of to the Hilwalkal Corporation of New York. The plant is said to have brought about $700,000. Recently the W. Beckers Aniline and Dye Works Co. was absorbed by the National Aniline and Chemical Co. The latter company has also disposed of its plant at Wappingers' Falls, N.Y., thus consolidating all its activities at its main plant (formerly the Schoellkopf Works) at Buffalo.

The Perth Amboy plant of McKesson & Robbins, Inc., manufacturers and dealers in chemical and pharmaceutical products, has been taken over by a new concern, known as the Norvell Chemical Corporation. Members of McKesson & Robbins are interested in the new company, which will manufacture miscellaneous chemicals.

Mr. John Helfrich, of the Chemical Catalogue Company, Inc., has been confined to the Newark Private Hospital, Newark, N. J., for some time, undergoing an operation. Mr. Helfrich has progressed favorably, and will be able to return to business in the near future.

Mr. Donald R. Staddon, of D. R. Staddon & Co., has returned from a business trip to England, and is resuming personal charge of the affairs of his firm.

Dr. Charles F. Lindsay, formerly with the Imperial Munitions Board for Canada, the British Military Mission in the United States, the J. C. White Engineering Co., etc., has accepted a position as Technical Assistant to the President of the U. S. Rubber Co., one of the largest manufacturers of rubber products in the world. Dr. Lindsay's headquarters will be in New York City.

Mr. A. L. Webre, of the engineering staff of E. B. Badger & Sons Co., Boston, is in California on business. Mr. E. B. Bager II., of the same company, is making a tour of the South Seas in company with a number of Boston business men, and when last heard from was at Panama, on his way to the Southern Pacific, and reported a pleasant and interesting voyage.

Dr. J. E. Teeple, Consulting Chemist, New York, is in California on business, and is expected back in New York in the near future.

Mr. T. E. O'Reilley, of Toronto, was a visitor at the Chemists' Club, New York, recently.

Mr. R. L. Dorrance, of the Experimental Farm, Ottawa, Canada, was a visitor to New York for a few days this month. Mr. Dorrance was attending the Poultry Show, in which he is interested, being connected with the chemical side of certain poultry investigations at the Experimental Farm.

President Maclaurin, of the Massachusetts Institute of Technology, died of pneumonia last week. Dr. Maclaurin had just completed his work in connection with raising a $4,000,000 endowment fund for the Institute. An anonymous donor had promised to add another $4,000,000 to the amount, if raised. The campaign was successful, and the donor revealed his identity, being George Eastman, of the Eastman Kodak Co. The securing of this magnificent provision for carrying on the work of the M. I. T. was merely the crowning achievement in a life devoted to the progress of science and engineering education. Dr. Maclaurin was born in Scotland and educated at Cambridge University, England. He was Professor of Mathematics at the University of New Zealand, later coming to America to accept a chair in Columbia Univerity, New York. From there he went to Massachusetts Institute of Technology. Dr. Maclaurin was respected and admired by thousands of engineers, chemists and business men throughout the United States. In his death the scientific world has sustained a great loss.

The Congressional Committee that has been investigating the expenditures of the Government for nitrogen fixation plants during the war is now going to Muscle Shoals to examine the plants and get some first-hand information. At the hearings Mr. Bernard M. Baruch, the eminent financier, justified the Government's expenditure of more than $100,000,000 for such plants, stating that had the war lasted six months longer the American plants would have placed the United States and its allies entirely independent of foreign sources of nitrates. F. S. Washburn, President of the American Cyanamid Co., also gave important testimony, testifying that had the war lasted any length of time after the plants were completed their cost would have been saved many times over. The general drift of the testimony seems to be against attempting to convert these huge plants into fertilizer plants.

Sir Oliver Lodge is in New York lecturing on the Structure of the Atom, and also on spooks, spiritualism and the unseen world. Carnegie Hall has been sold out long in advance for several lectures, and a supplementary course has been arranged for the Shubert Theatre. The round table at the Chemists' Club is taking a great interest in Sir Oliver and politics, the League of Nations, Freud, comparative religion and the other topics usually discussed there, to say nothing of chemistry, have been shelved to make room for ouija boards and transcendental communications. Apparently the spiritualistic mania that has lately engrossed so much attention in Great Britain has at last taken hold in the United States. The former more popular variety of "spirits" being taboo, it may enjoy quite a vogue.

TANNERIES IN SIBERIA.

There are now 167 tanneries working in Siberia, according to a recent report from Omsk.

Industrial News Items

British Columbia.

Vancouver.—Percy Scott Leggatt, of Thomas Summerson & Co., Darlington, England, spent some time on the Coast investigating the possibilities of an iron and steel industry. Mr. Leggatt claims to have unlimited capital behind him, and if he can obtain the necessary ore and power concessions he will erect electric furnaces at some favorable point. The furnaces would be built by his firm in England, and shipped to the Coast through the Panama.

A. P. Gillis has written to the Mayor of Vancouver, on behalf of the Tivani Electric Steel Co., of Belleville, Ont., claiming that he has the purchase of a bond issue of $5,000,000 arranged for the establishment of an electric iron and steel smelter in British Columbia, with a capacity of 200 tons per day, if the citizens of Vancouver will guarantee the interest on the bonds for a number of years, and also will guarantee the company 50,000 horse power continuous service at $10 per horse power year.

The Consolidated M. & S. Co. is erecting a new copper-ore crushing plant, to replace the one recently destroyed by fire. The new plant will be much bigger than the old one, and will be housed in a reinforced concrete building. The company is doubling the capacity of its already large machine shop by the addition of a wing 42 feet by 100 feet. T. Hopkins, who has just returned from England, where he had charge of ammunition work, has been given charge of the whole of the company's electrical work. The company is refining copper, lead and zinc electrolytically at the present time.

The Vancouver Engineering Works is installing an electric furnace for the production of special steels to be used in the construction of machinery that the company manufactures.

Manitoba.

Winnipeg.—The Magnet Metal and Foundry Co. intend making improvements to their plant at Elmwood. They have exclusive Canadian rights on several implements and tools.

Ontario.

Brantford.—The Dominion Steel Products, Lid., have commenced the construction of a new foundry building, to be equipped with two cupolas and a 16-ton capacity air furnace for the casting of rolls for rubber-working machinery.

Stratford.—The Canadian Edison Appliance Co., Ltd., have taken over the old Mooney Biscuit Factory, and will shortly commence the manufacturing of electric heating devices. This company is comprised of the manufacturing department of heating devices of the Canadian General Electric Co., and the organizations of the Canadian Hotpoint Electric Co. and the Hughes Electric Co., Ltd., of Toronto.

Toronto.—Willard's Chocolates, Ltd., have commenced the erection of a large plant at the corner of Dupont Street and Manning Avenue, for the manufacture of ice-cream, at a cost of $250,000.

The Dunlop Tire and Rubber Co. are erecting another factory here, at a cost of $1,500,000, which will be used especially for the making of auto tires.

From January 1st to December 31st, 1919, thirty-eight new factories were erected in Toronto, according to the report of the Toronto Harbor Industrial Department. . On the Toronto Harbor property industries have been established to date with a total capital of $15,000,000.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Zinc.

Cornelius E. Cornelius, 194875, December 16, 1919. The volatile products from the furnace are cooled so that all the Zn or Zn and Pb is condensed into solid state chiefly powder and thus freed from the reduction gases and may then be liquefied by heating. The gaseous products are cooled in channels or tubes surrounded by water or air.

Separation of Sulphur from Furnace Gases.

C. G. Collins, 195076, December 16, 1919. The furnace gases are cooled and further reduced in a dry state until the condensation point is reached while the gases are in contact with a collecting material, such as asbestos.

Fuel.

T. M. Hickman, 195186, December 23, 1919. Non-coking carbonaceous material may be successfully coked.

Potassium from Mineral Bearing Rocks and Clays.

A. Grauel, 195171, also 195172 and 195464, December 23, 1919. Appliance consists of a furnace for volatilizing the K.

Charcoal from Wood.

A. B. Roxburgh, 195246, December 23, 1919. Wood is caused to descend by gravity through an air-tight retort which is externally heated to a gradually increasing temperature towards the lower end and the charcoal formed is cooled before being discharged from the retort.

Extracting Bromide from Brine.

H. H. Dow, 196397, January 20, 1920. Bromine is extracted from Br-containing brine by systematically over-oxidizing the brine whereby Cl as well as Br is liberated, and then eliminating the Cl by the use of bromide so that the net result of the oxidation is substantially equal to the Br content.

Electrolysis of Solutions.

V. Gruner, 196675, January 27, 1920. Efficiency increased, anode protected by addition of water glass.

Universal Red Dye.

C. C. Huffman, 196172, January 13, 1920. A universal alkali-proof red dye combined with soap.

Universal Blue Dye.

C. C. Huffman, 196173, January 13, 1920. A blue dye soap is made by combining about 426 parts of a vegetable oil with 152 parts of NoOH solution of 1.40 sp. gr. at about 18° and adding to the composition, just prior to complete saponification, 128 parts of hot H_2O containing methylene blue in solution.

Universal Yellow Dye.

C. C. Huffman, 196174, January 13, 1920. A yellow dye combined with soap, consists of the reaction products of a saponifiable substance, a saponifying agent and chrysoidine.

Universal Brown Dye.

C. C. Huffman, 196175, January 13, 1920. A brown dye soap is prepared by substituting for the methylene blue solution used in Canadian Patent No. 196173 (supra) analine acid red 7.5 chrysoidine yellow 7.5, direct black 5, and methylene blue 0.5 oz. separately dissolved and added to the soap before saponification is complete.

Dark Dye Combined With Soap.

C. C. Huffman, 196176, January 13, 1920. Dark-colored dye soaps are prepared by mixing a vegetable oil with excess alkali, adding, just before saponification, a quantity of dye sufficient to produce the required dark shade.

Separating Nickel from Nickel Copper Mattes.

J. Dhavernas, 195990, January 13, 1920. The matte is roasted to remove part of the S, the resulting oxides are reduced to metallic form and treated with an acid to dissolve the Ni, any Cu in the solution may be proportioned with metallic Ni, the solution of Ni salts is then treated to produce metallic Ni. It is then desirable to have about 8 per cent. S in the roasted matte.

Ore Concentration..

R. Ellis, 196361, January 20, 1920. A mixture of air and a frothing agent in vapor form is introduced into an ore pulp to form a froth which is removed.

Protecting Metal Pipes Exposed to High Temperatures.

L. B. Skinner, 195819, January 6, 1920. The metal conduits of regenerative furnaces are protected by depositing on their surfaces a coating of fume, preferably ZnO from the heating gases.

Ore Concentration.

R. B. Martin, 195049, December 16, 1919. An oil which has been modified by heating it with S is used as a frothing agent.

Method of Treating Gases.

Ing. Hechenbleikner, 194491, December, 1919. A mixture of phosphate rock, a silicious material containing K and coke is subjected to the action of an electric furnace, the resulting gases are oxidized after leaving the furnace and then certain impurities, such as SiO_2 and SiF_4, are removed while maintaining the K and P in gaseous form.

Peat.

J. A. Oligny, 194828, December 9, 1919. Peat is immersed in a solution of NaCl and $CaCl_2$ which has been subjected to electrolysis. The electrolysis may be continued during the immersion of the peat.

Recovering Vanadium from Certain Iron Ores.

Wm. M. Goodwin, A. F. G. Cadenhead, 195078, December 16, 1919. Pig Fe is produced from the ore; it is then decarburized, the slag thus produced containing the alloying metals is refurnaced in the presence of fresh ore successively and continuously until the desired ferro-alloy is produced. V may thus be extracted from its ores as ferro vanadium or other ferro-alloy.

Utilization of Tin Scrap.

D. A. Wilcox and S. H. Wilcox, 194842, December 16, 1919. Tin-scrap is treated with Cl at a temperature sufficient for the conversion of Fe and Sn into chlorides and volatilization of the latter, and the chlorides are then separated from each other by fractional condensation.

Sulphuric Acid.

H. V. Welch, 194775, December 9, 1919. Apparatus is specified.

Contact Process and Apparatus for Producing Sulphuric Acid.

H. V. Welch, 194776, December 9, 1919. The suspended material is removed from the hot gases by electric proportion in a high-tension electric field, and the hot gases are passed through a contact mass of catalytic material to produce SO_3, then a water spray is introduced to cool and absorb the SO_3 and form H_2SO_4 mixture, which is precipitated in an electric field. Apparatus is also specified.

Method of Concentrating Solutions.

H. V. Welch, 194777, December 9, 1919. By evaporation and electrical precipitation of fume.

Manufacture of New Therapeutic Agents of the Phenacetin Type.

J. Tcherniac, 195615, December 30, 1919.

Treatment of Gases Containing Sulphur Dioxide.

Edward V. Espenhahn, 195152, December 23, 1919. The gases are washed with a solution of alk. thio-sulphate to form polythionates, the solution of which is heated to form sulphate. The sulphate is reduced to sulphide and other polythionate solutions formed in the process are treated with the sulphide to form thiosulphate which is used for washing fresh gases.

Refractory Cements.

Harvey B. Booth, 195896, January 6, 1920.

Asbestos Cement.

H. S. Ashenhurst, 195111, December 23, 1919.

The Recovery of Lead and Silver from Sulphide Ores.

Solomon Ganelin, 196381, January 20, 1920. Pb and Ag are recovered from their sulphides by mixing the ore with $ZnCl_2$ and heating during agitation in a continuously operating closed furnace, then leaching the Pb and Ag chlorides, taking precautions to prevent reaction between the sulphides and the dissolved chlorides. The Pb is recovered free from Zn and the $ZnCl_2$ is regenerated.

Dyes Mixed With Soap.

C. C. Huffman, 196177, January 13, 1920. A vegetable oil, such as olive or corn oil, is saponified with NaOH or KOH and a solution of an aniline dye (acid red) is added when saponification is only partially complete. The mixture is agitated and molded at a temperature of about 50° and the reaction is permitted to continue to completion. Due to the reaction, the temperature of the mass rises about 30° during the first two hours in the mold, and after gradually lowering to room temperature the material is pressed into coke form.

Acetaldehyde.

E. Steinbuch, P. Schetelig, 195354, December 23, 1919. In the manufacture of CH_3CHO from C_2H_2, in the presence of Hg compounds, the Hg catalyst is regenerated in the reaction liquid by means of an oxidizing treatment with an electric current.

Process for the Treatment of Tungsten Ores.

J. C. Blanch, 195967, January 13, 1920. Tungsten ores treated with a mixture of NaCl H_2So_4 and a nitrate to dissolve the oxides of Fe and Mn and the residue is treated with a mixture of NaCl H_2So_4 and a nitrate to complete solution of the Fe and Mn oxides. The Fe and Mn are recovered by evaporating the solution. The Fe may be separated from Mn in solution by Mn acetate. The W is extracted from the solid residue by briquetting the latter and heating with a reducing agent.

Government Publications

By S. J. COOK

(NOTE: Recent Government publications of scientific, technical or educational value are reviewed here from month to month. Unless otherwise stated, these publications may be obtained free by those interested, upon application to the Department of the Government issuing the same.)

Department of the Interior.

Hydrometric Surveys. (Water Supply Bulletin No. 9), for the year ending September, 1917. 384 pp.

"The chief functions of a hydrometric survey are the collection of data relating to the flow of surface waters and a study of the conditions affecting this flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation, and water-power development, storage, seepage, etc., which may be of use in the development of water resources." These sentences, taken from the opening paragraph of the Introduction, outline clearly the work of the service. There follows a description of the way in which the work is carried on and the extent of the work done during the year now reported. This takes thirteen pages. The remainder of the book is given to data regarding the various basins studied, and from the statistics recorded the extent of the work done may be observed to be very great. All the information gathered is of value, even though no further use is made of it than to prevent some one else going into these districts only to find that no commercial or economic advantages may be gained from the small streams in the district. This negative value is, of course, the minimum value, and a large part of the work done will lead to the exploitation and building up of sections of the country at present not being utilized to the fullest extent.

Department of Mines.

Geological Survey.—Map. No. 1726. Athapapuskow Lake Region. (Manitoba and Saskatchewan.)

Memoir 116. Investigations in the Gas and Oil Fields of Alberta, Saskatchewan, and Manitoba. By D. B. Dowling, S. E. Slipper, and F. H. McLearn. 89 pp. 9 sketch maps. 1 plate. 4 figs. This little booklet is one of those contributions to the scientific advance of the country, which are so often neglected by those in search of schemes whereby they may instantly become absurdly rich. It is replete with what information there is about gas and oil in the western provinces, with which it deals, and proves very interesting reading to one who wishes to know what has been done towards developing the natural resources of that section of the Dominion. The search for new sources of fuel, coupled with the natural trend of geological survey work led to investigations now reported on briefly. The first section deals with the structure and correlation of the formations underlying Alberta, Saskatchewan, and Manitoba. Part 2 sketches the geology of Southern and Central Alberta, while the third part has for its subject the cretaceous of Peace and Athabaska valleys. The rest of the book is taken up with pages of information of detailed examinations made of selected wells. Those interested in the gas and oil resources of the west should read this bulletin, and the general reader will find in it much of great interest.

Mines Branch.—Bulletin No. 30. *Smelter Treatment Rates.* 45 pp.

When the Consolidated Mining and Smelting Co., at Trail, B.C., raised the rates for the treatment of lead ores at its smelters, some of the shippers objected strongly, and at the meeting of the Associated Boards of Trade of South-Eastern British Columbia, at Nelson, in February, 1918, a resolution was passed asking that the Federal Government investigate the matter. A committee was appointed subsequently, but when the investigation began the shippers apparently were by this time satisfied with the new schedule, or at any rate were unwilling to take further action in the matter. The investigation, however, was continued, and the results of the study thus inaugurated are given in the bulletin now reviewed. The report is informative and much of the data is shown in graphic form.

Production of Coal and Coke During the Calendar Year 1918. 40 pp.

Production of coal by companies and by provinces, together with similar data relating to coke, are given in this report from the Mines Branch.

Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals, in Canada, During 1918. 74 pp. This report is usually included in the "Annual Report of the Mineral Production in Canada," but this practice is being departed from this year. All the facts available relating to the various metals with which the report deals are collected and given for the use of those in search of such data. The names of the metals are arranged in alphabetical order, for ease of reference. The compilation was made by Mr. Buisson, of the Mines Branch Staff.

Department of Public Works.

Report of the Minister for the Year Ended March 31, 1919. 157 pp.

Once a year, in accordance with the provisions of chapter 39 of the Revised Statutes, the Minister of Public Works writes down in a book the story of where the money went that was expended during the year on public buildings, harbors, and the "what-not" of the Government's many ways of keeping up post-offices and bridges, erecting Parliament Buildings, and generally looking after the people's property in such a way as to prove satisfactory to the greatest number of folk having the true advance of the country at heart. This, then, is the story for the last fiscal year and those who "want to know" may find out from the 157 pages of facts herein recorded.

Department of Trade and Commerce.

Dominion Bureau of Statistics.—Monthly Report of the Trade of Canada for October. 428 pp.

Detailed statistical data regarding imports and exports by ports, commodities, places of origin, giving quantities and values for all items. The regularity with which this publication appears is a credit to Mr. Warne and his staff in the External Trade Division of the Bureau.

Commercial Intelligence Branch.—Weekly Bulletins, Nos. 829-832.

Weekly Bulletins, Nos. 829-832.

Page 1349. The British Preferential Tariff. Several pages of quotations from the tariff.

Page 1365. Importations of calcium carbide into China amount to about 300 tons per annum.

No. 831. Page 28. The Economic Situation in South Russia. Compiled from notes supplied by the British Economic Mission and the British Vice-Consul at Rostov-on-Don.

Pages 37-47. Trading in Spain, By W. McL. Clarke. Trade Commissioner. Pages 46 and 47 deal particularly with the chemical markets in that country. Pages 87-91 continue the article.

THE DEVELOPMENT OF A REALLY ACID AND ALKALI-PROOF PAINT.

FOR ages the preservation of property has been a problem of considerable magnitude, and paint has been an important factor in the problem, as it has done splendid work in keeping down to a minimum the number of figures in the maintenance column. There was, however, one troublesome condition with which the paint manufacturers seemed unable to cope, and that was to produce a paint that would withstand the action of both the strongest and mildest acids and alkalis. Some of them were able to manufacture a paint that would, for a time, afford protection against very mild conditions, but it was only recently that one manufacturer succeeded in perfecting a paint that would protect any surface against the action of all acids and alkalis, or fumes of the same, in any strength.

It is evident this paint is manufactured on an entirely new principle and has been perfected after long practical experimentation, rather than from theoretical considerations, as it contains none of the commonly used materials, such as turpentine, oil, lead, pigment, asphalt or coal-tar—and yet is applied cold with a brush or spray, by the ordinary method.

This paint is said to be manufactured from nothing but rare acid and alkali-proof gums, dissolved in a quickly evaporating solvent. Within a very short time after the paint is applied the entire solvent is said to evaporate. This naturally leaves only the acid and alkali-proof gums, which form a permanent, protective coating. When these facts are known, one can readily understand why the coating of these rare acid and alkali-proof, non-deteriorating gums cannot dry out, carbonize, crack or peel.

The paint is claimed to adhere permanently to any surface, stand heat to 350 degrees Fahrenheit, and to be highly electrolysis-proof.

This product should certainly be a boon to those having serious acid and alkali conditions, as it is a great improvement over the materials generally used in the past, such as asphalt and coal tar, which, as most users have experienced, soon carbonize, split, or peel. "Lead and oil" paint has given fairly good results under mild conditions, but it is soon destroyed by acids and alkalis, or their fumes, in any reasonable strength, because the binder, which is linseed oil, is quickly affected, leaving the dry lead to crumble away.

SPECIFICATIONS FOR REAGENTS.

In the belief that a valuable service can be rendered both to the manufacturers and users of reagents and apparatus, through standardization, the American Chemical Society appointed a committee which is now organized and at present is collecting data regarding the quality of reagents on the market. This is a work from which Canadian chemists and manufacturers will undoubtedly profit, as well as American chemists.

It seems that in general the experience of users agrees with that of the Bureau of Chemistry, as reported by H. E. Buc, in the December number of the Journal of Industrial and Engineering Chemistry. The chief complaints appear to be in regard to the lack of reliability of the analyses rather than unsatisfactory purity of the reagents themselves. It is also evident that in many instances impurities which have caused dissatisfaction could have been removed by exercising sufficient care in production. Insufficient knowledge on the part of the producer, both as to requirements and acceptable methods for testing, has been one cause for any dissatisfaction relative to reagents. Some makers have signified a willingness to follow standard specifications and methods of testing, and the committee therefore proposes to begin work on the specifications for sulphuric, nitric, and hydrochloric acids and ammonia. This will be followed with specifications for other reagents. It is requested that suggestions be sent to the secretary of the committee, W. D. Collins, Bureau of Chemistry, Washington, indicating the specifications which would be acceptable, the use to which the reagents are put in any special case, and the methods which are satisfactory in determining the purity of the reagents and the presence and amount of objectionable impurities.

In the near future co-operation in the standardization of laboratory apparatus will be sought.

An abstract of the article by H. E Buc, referred to above, follows:

Chemicals Received by the U.S. Bureau of Chemistry During the War.

1. During the last four years about 1,300 shipments of chemicals from a large number of dealers and manufacturers have been tested in the Bureau of Chemistry. The greater part of the reagents bore an analysis on the label.

2. Most of the chemicals examined are satisfactory. Occasional impurities are found often enough in chemicals from practically all manufacturers to make it necessary to test all shipments.

3. The standard acids, ammonia, alkali salts and alkali, and most of the organic solvents are generally satisfactory.

4. The soluble salts other than alkali salts are generally acceptable, but are seldom of a high degree of purity.

5. Certain organic solvents and solids are either unobtainable or unsatisfactory.

6. The insoluble products are generally unfit for use in analytical work.

INCREASED ZINC OXIDE AND LITHOPHONE PRODUCTION.

The New Jersey Zinc Company announces the contemplated construction of additional Zinc Oxide and Lithopone plants to meet the rapidly growing demand for these products. Construction work will be commenced immediately on Zinc Oxide and Lithopone plants in Colorado and Pennsylvania.

The New Jersey Zinc Company was organized in 1848. It is the oldest and largest zinc company in America. Its ore properties are located in various parts of the country, and numbered among these is the famous Franklin, New Jersey, Mine. The company is now operating Zinc Oxide, Lithopone and Slab Zinc plants in Pennsylvania, Virginia, Illinois, Wisconsin, Kansas and Oklahoma. Its products are carried in warehouses in Brooklyn, Newark, Philadelphia, Pittsburg, Cleveland, Chicago, Los Angeles and San Francisco.

CONIAGAS ENTERS GOWGANDA.

The latest of the large silver companies to enter the Gowganda mining field is the Coniagas Reduction Company, Ltd., whom, it is understood, have taken options on a number of valuable claims situated in the Gowganda area.

TABLE SHOWING IMPORTS INTO CANADA FOR THE MONTH OF NOVEMBER (1918 AND 1919), OF LEADING CHEMICALS.

NOTE—Except where otherwise stated the quantity is in pounds.

Imports from	Boracic Acid. 1918.	1919.	Muriatic Acid 1918.	1919.
United Kingdom ..	1,344	....	....	....
United States	49,525	16,307	16,840	16,732
	Nitric Acid. 1918.	1919.	Sulphuric Acid. 1918.	1919.
United Kingdom ..	....	....	....	....
United States	5,034	8,020	2,154,133	246,796
	Acetic Acid. (Not over 30% strength) 1918.	1919.	Oxalic Acid. 1918.	1919.
United Kingdom ..	....	....	9,124	11,512
United States, Gal.	471	....	3,851	6,923
	Stearic Acid. 1918.	1919.	Tartaric Acid, Crystals. 1918.	1919.
United Kingdom ..	....	....	....	34,680
United States	7,706	19,270	18,240	37,834

Total value of imports of all acids for November, 1918: From United Kingdom, $13,003; from United States, $90,421; from other countries, $11,841. For November, 1919: From United Kingdom, $41,226; from United States, $78,608.

Pharmaceuticals.

Total value of all drugs, medicinal, and pharmaceutical preparations imported during November, 1918: From United Kingdom, $88,437; from United States, $182,695; from other countries, $53,902. During November, 1919: From United Kingdom, $63,450; from United States, $247,562; from other countries, $43,858.

Dyes and Tanning Materials.

Total value of all dyes and tanning material imported during November, 1918: From United Kingdom, $21,733; from United States, $467,559; from other countries, $72,309. During November, 1919: From United Kingdom, $52,980; from United States, $569,178; from other countries, $18,765.

Paints, Pigments and Varnishes.

Total value of all paints, pigments and varnishes, imported during November, 1918: From United Kingdom, $21,814; from United States, $338,673; from other countries, $228. During November, 1919: From United Kingdom, $45,330; from United States, $348,129; from other countries, $1,944.

Fertilizers.

Total value of all fertilizers, including phosphate rock, acid phosphate, guano and manufactured fertilizers, imported during November, 1918: From United Kingdom, none; from United States, $60,050. During November, 1919: From United Kingdom, $40 (being for 2 cwt. of guano); from United States, $48,018. None was imported from other countries in either period.

Inorganic Chemicals.

The imports of some of the more important inorganic chemicals for November are (in pounds):

Imported from	Ammonium Nitrate. 1918.	1919.	Copper Sulphate. 1918.	1919.
United Kingdom ..	....	250,827	....	44,748
United States	....	593,675	797,550	33,886
Norway	....	483,502	....	....
	Potassium Bitartrate. (Cream of Tartar) 1918.	1919.	Soda Ash. 1918.	1919.
United Kingdom ..	....	38,690	1,161,440	302,102
United States	15,795	42,332	5,523,655	6,459,184
France	....	47,099	....	....
	Potassium Chlorate. 1918.	1919.	Sodium Bicarbonate. 1918.	1919.
United Kingdom ..	....	....	113,814	66,922
United States	1,711	41,389	490,530	369,381

Total value of all inorganic chemicals imported during November, 1918: From United Kingdom, $98,138; from United States, $770,842.

Total Imports of All Chemicals.

Total value of all chemicals and allied products imported during November, 1918: From United Kingdom, $366,010; from United States, $2,882,118; from other countries, $257,098. During November, 1918: From United Kingdom, $425,577; from United States, $2,926,217; from other countries, $189,478. Grand total from all countries for November, 1918, $3,505,526; for November, 1919, $3,541,272.

Exports.

Sulphuric Acid—To United States, November, 1918, $9,670; November, 1919, $6,117. To United Kingdom and other countries, none in either period.

Total acid export—In November, 1918, none to United Kingdom or other countries, and $9,670 to the United States. In November, 1919: To United Kingdom, $36,756; to United States, $14,216; to other countries, $38,147. Included in these figures are the exports of acetic acid, but to date no official returns on acetic exports alone are available.

Drugs and Pharmaceutical Exports—Total value of exports of drugs and pharmaceuticals during November, 1918: To United Kingdom, $4,213; to United States, $25,439; to other countries, $866. During November, 1919: To United Kingdom, $19,177; to United States, $96,269; to other countries, $40,988. The chief item in these exports is senega root, of which $79,293 was exported in November, 1919, to the United States.

Fertilizer Exports—Total value of fertilizer exports for November, 1918, $191,577, of which all went to the United States. For November, 1919, $593,117, of which all but $7 worth went to the United States. The chief item in these exports is cyanamid to the United States amounting to $583,081 for November, 1919. The balance was in manufactured fertilizers.

Paints, Pigments and Varnishes—Total value of these exports for November, 1918: To United Kingdom, $16,575; to United States, $22,197; to other countries, $130,796. For November, 1919: To United Kingdom, $52,566; to United States, $28,340; to other countries, $136,298.

Inorganic Chemicals—The chief item in these exports is calcium carbide, of which $14,400 went to the United Kingdom in November, 1919, and $267,304 to the United States in the same month. Of acetate of lime, $25,653 worth was exported to the United Kingdom in November, 1919. Of ammonium sulphate, $123,769 was exported to all countries in November, 1919, going principally to British Guiana and other countries, not including the United States. The United Kingdom received $13,441 worth of ammonium sulphate in the same month. The total value of exports of inorganic chemicals to all countries for November, 1918, $468,044; for November, 1919, $521,486.

Total value of exports of chemicals and allied products: For November, 1918, $27,599,665; for November, 1919, $2,026,993. The large decrease is, of course, due to the stopping of shipments of explosives (classified as chemical products) which amounted to $26,243,530 alone in November, 1918, of which $16,637,871 worth was shipped to the United Kingdom.

REORGANIZED LABORATORY SUPPLY HOUSE.

It will be of interest to Canadian chemists to learn that the Canadian Laboratory Supplies, Limited, have been going through a process of reorganization. This young company has had an unusually large amount of business in the very short time since they launched out with the idea of giving to Canadian chemists a complete Canadian service in laboratory apparatus, and deserve much encouragement for their enterprise.

On January 1st they entered a new period with larger capital, larger stock, increased staff, and in every way they should now be better able to handle Canadian business. They have behind them an experience of eighteen years in the laboratory supply business, together with a staff of technical advisers, which indeed makes a very strong and necessary organization for a business of this kind.

The officers of the company are much the same as before, excepting that Mr. F. G. McKay, President, has resigned, to take over interests in an allied field. Mr. Jas. H. Wilson, formerly Vice-President, is now President and General Manager. The financial and accounting end is in charge of Mr. Harry B. Hall, Secretary-Treasurer of the company, who for a number of years was connected with one of Canada's largest financial institutions. The Western representative of this concern is Mr. J. Stephen Neil, formerly connected with public health administration in the British Isles.

Mr. J. C. Roberts represents the company in the East. He is a graduate in Chemistry of a well-known U. S. university, and has only recently returned from France, where he was honored for his services in the Intelligence Department by being awarded the Croix de Guerre.

PULP AND PAPER EXPORTS.

Total pulp and paper exports from Canada for the first eight months of the fiscal year of 1919 amounted in value to $64,626,540, against $53,954,984 in 1918, an increase of $10,671,556 for 1919, distributed as follows:

Eight Months.	1918.	1919.
Paper and Mfgs. of....	$28,886,120	$37,985,676
Pulp, chem. prep.....	21,760,738	21,082,402
Pulp, mech. ground....	3,308,126	5,558,462
Totals.	$53,954,984	$64,626,450

Chemical, Oil, and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

The month of January was a busy one for all dealers and manufacturers of chemicals. This is a statement amply verified by inspections of plants and by the returns of dealers and manufacturers for the month. The market as a whole has shown a gradual improvement, all prices are firm, and several advanced. It is interesting to note the decidedly divergent views held by dealers on the present high rate of exchange on Canadian money in the United States. Those who find it necessary to purchase in the States are naturally lamenting the high rate which has been responsible for advances here in those lines coming from across the line; on the other hand, manufacturers who are endeavoring to build up and expand Canadian-made products are rather delighted with the rate. There is no doubt, of course, but that the rate acts as an increase to the tariff, but the most progressive policy would be not simply to work under this added advantage to Canadian products, but to expand the Canadian manufacturing of chemicals to include many not made here at present. Of course what one manufacturer said on this matter a few days ago, namely, that Canadian consumers were beginning now to look around and see whether such and such a product was or was not made in Canada and whether it could be obtained here at least from stock on hand by agents of United States firms, is no doubt true to quite an extent. However, high or low exchange, business is decidedly good in all lines, especially in heavy chemicals, both at Montreal and Toronto. A shortage in electric power more or less seriously effected many chemical plants during January, and it is to be hoped this will soon be adjusted.

Acids.—The market has been firm and strong in acids. Hydrofluoric, 60%, advanced three cents during the last week in January and is now quoted at 25 cents per lb. Hydrochloric acid, 18%, has advanced 15 cents during the month, and prices ranging from $2.75 to $3.00 per 100 lbs. are being received. On February 1st, Boric acid advanced a cent per pound, 19½ cents being the prevailing rate. Sulphuric remains steady. In the United States business in sulphuric is some better, due to the coal business getting back to normal and the easing up of the phosphate rock situation. Battery acids advanced ½ cent per pound at Toronto on February 1st.

Caustic Soda.—There is a splendid business in caustic soda both in Canada and the States. A feature of the market has been the numerous enquiries received by Canadian manufacturers for this product from Japan. Canadian producers could receive higher prices for their caustic were they to take up this Japanese business, but such action would leave their customers here in a bad hole. Enquiries are even being received at Montreal and Toronto from England for caustic soda, the coal miners' strike epidemic there having lowered production.

Wood Products.—The trade in wood products, wood alcohol, acetone, etc., is very strong with a heavy demand. Practically all the plants are sold out for from three to four months ahead. The Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa, have issued a report on the wood products industry. There are thirteen such plants in Canada, eleven of which are distillation plants and two refineries. In Ontario there are seven distillation plants and one refinery, and in Quebec, four distillation plants and one refinery. During the war this industry expanded rapidly. The total value of these products made in Canada in 1915 was $2,434,716, and in 1917, $5,261,176.

Acetic Acid and Paraldehyde.—The outlook in the acetic acid and paraldehyde trade at present is for a "fair to good" volume of business during the next six months, in which about the only discouraging feature is the high exchange rate on Canadian money in England—where the bulk of the acetic acid is shipped. Should Canadian producers increase the price in England to cope with the exchange rate competition from Germany would then be feared. In fact, some competition from Germany has been met with by Canadian shippers in Belgium and Holland. The demand for acetic acid and paraldehyde has greatly increased both in the United States, Europe, and the Far East. The large stocks on hand in England and the United States on the conclusion of the war have been greatly reduced and it is expected that they will be entirely exhausted by the first of May next. Acetic acid, like practically all other chemicals, cannot be manufactured now at pre-war prices, and therefore some advance in price may be looked for. Shipping space to Europe is very difficult to secure, and the freight rates to Europe in acetic acid are very high ($40 per ton from Montreal), whereas to the Far East, where a large volume is also shipped, the rate is only $25 per ton.

Pharmaceuticals.—The market in pharmaceuticals has remained firm during the month and indications are that it will continue so for some time. Prices show no tendency to drop and the demand on the drug supply houses is steady and fairly heavy.

Formaldehyde.—It is interesting to note the jump in the price of this product of nearly 20 cents per lb. during the month. Wholesale price is now 45 cents and that is considered really a low figure and it may advance at any moment. This is due to the increase in the price of methylated spirits used in the manufacturing of the formaldehyde.

Alcohols.—The demand for alcohols is good, and methylated spirits are almost impossible to get. Latest quotations on the methyl were $1.75-$2.00 per gallon. The best one can do on the pure alcohol, 65% O.P., is $9.00 per gallon, while wood alcohol is list quoted at $2.85.

Current English Prices.—The current prices in England on some of the more important chemicals are: Commercial acetone, per lb., 1s, 10d; boric acid (powder), per lb., 1s, 3½d; tartaric acid (powder), per lb., 4s; pure methyl alcohol, per lb., 24s, 9d; aluminum sulphate, commercial, per lb., 6d; borax, commercial (crystals or powder), per lb., 7d; calcium chloride, coml. fused, per lb., 5½d; coumarin, per oz., 5s 8d; dextrine, coml. white, per lb., 1s, 3d; caustic soda, granular, 98 per cent., per lb., 8d; soda ash, pure crystals, per lb., 4d; pure anhydrous, per lb., 8½d.

Oils and Naval Stores.

Turpentine.—With a heavy demand both export and domestic turpentine has shown an upward curve during the past month. The price at Toronto, February 1st was $2.95 per gallon, as compared with $2.35 on January 1st. The large stocks which were being held on hand for shipment to Europe, principally to Germany, once the United States ratified the Peace Treaty, have been partly disposed

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Proposals from a British or American firm wishing to establish Canadian Connections will be considered

of to Japan buyers. The market is firm and the tendency is toward an even higher price. Rosins are remaining steady with a good demand and prices about the same as at New Year's, except the increased exchange rate must be added.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

Acetanilid, C. P.	Lb.	$ .. — .70
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.04½—.05½
Acetic acid, refined	Lb.	.18½—.19½
Acetone	Lb.	.18½—.23½
Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, pure, bbl., 65% O.P.	Gal.	.. — 9.00
Alcohol, methylated, bbl.	Gal.	1.75— 2.00
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 2.85
Alum, Ammonia, lump and ground	100 Lbs.	.. — 5.00
Aluminium Sulphate, high grade, bags	100 Lbs.	3.25— 3.50
Ammonia, Aqua 26	Lb.	.10½— .16
Ammonium Carbonate	Lb.	.. .17
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Arsenic	Lb.	.. — .09
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. 1.15
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Caffeine, English	Lb.	.. — 8.50
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	30.00
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Camphor Monobromate	Lb.	.. — 5.75
Carbolic Acid, white crystals	Lb.	.. — .25
Carbon Bisulphide, in drums	100 Lb.	.22— .25
Carbon tetrachloride, drums	Lb.	.20— .24
Caustic Soda, ground, bbl.	Lb.	5½— .06
Chalk, Precipitated	Lb.	.04¼— .06
Chloroform	Lb.	.45— .55
China Clay, imported	Per Ton	20.00—25.00
Citric Acid, domestic, crystals	Lb.	.. — 1.15
Cobalt Oxide, black	Lb.	.. — 1.65
Copper Sulphate (Blue Vitriol)	Lb.	.. —.10¾
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.05
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.40— .45
Formaldehyde	Lb.	.. — .45
Formic Acid, 75%	Lb.	.40— .42
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Glycerine, drum, C.P.	Lb.	.. — .25
Hydrofluoric Acid, 60%	Lb.	.. — .22
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.. — 1.05
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.04¼—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	.. —70.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	.. —65.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Naphthaline flake	Lb.	.10— .11
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Oxalic Acid	Lb.	.25— .26
Oleic Acid	Lb.	.. — .23
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.10
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.75— .85
Phenacetin	Lb.	3.10— 3.25
Quinine	Oz.	1.02— 1.50
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Saccharin	Lb.	4.75— 5.00
Salicylic Acid	Lb.	.75— .90
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.2¾— .03
Sodium Acetate	Lb.	.14— .16
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Nitrate, refined	100 Lbs.	6.75— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.19— .20
Sodium Nitrite	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.25— 4.75
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.65
	Per Cwt. in Car Lots	.. — 1.60
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .42
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 2.75
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tannic Acid, commercial	Lb.	.75— .85
Tartaric Acid, crystals or powdered	Lb.	.78— .80
Tin Chloride, crystals	Lb.	.47— .50
Ultramarine, Blue	Lb.	.18— .45
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting	Per Ton	25.00—30.00
Zinc Sulphate, com.	Lb.	.05½— .06
Zinc Dust	Lb.	.13—.14½

Metals.

Aluminium, No. 1, 98-99%	Lb.	.32— .40
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .22
Brass, red	Lb.	.. — .25
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. — .23
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Fluorspar, ground	Ton	.. —30.00
Fluorspar, ground	Lb.	.. — .06
Fluorspar, lump	Lb.	.. — .05
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.09¾
Lead, in car lots	Lb.	.. —.09½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.40— .45
Platinum, pure	Oz.	155.00—160.00
Silver, bar	Per Troy Oz.	.. —1.34½
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
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Tin	Lb.	.. — .73
Zinc, sheets	Lb.	.. — .12

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Motor Gasoline (service stations)	Gal.	.. — .35
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Naphtha	Gal.	.. — .31
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Fuel Oil	Gal.	.. —.09½
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 2.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 4.75
Crude Creosote Oil	Bbl.	16.00—18.00
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Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
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Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
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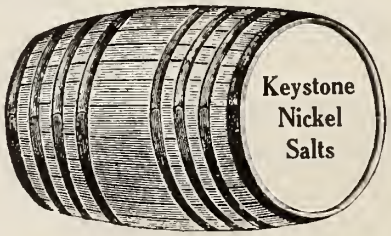

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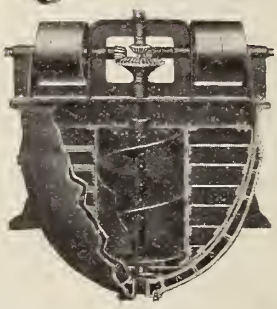

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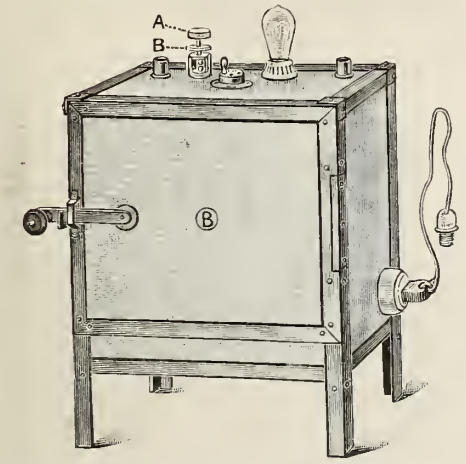

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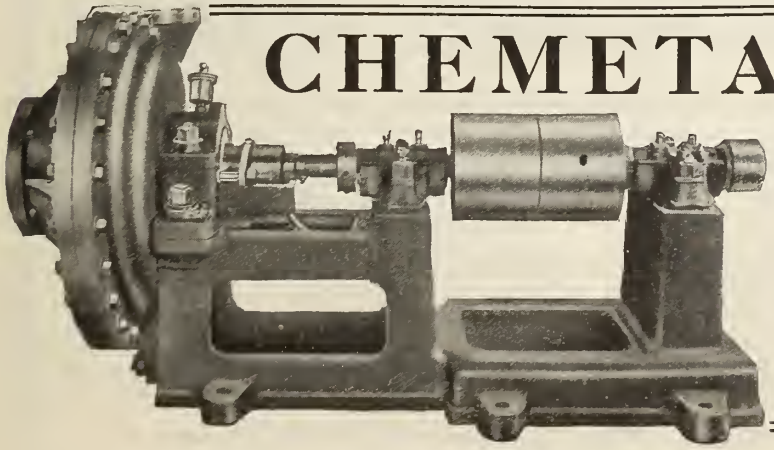

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Silver	$185,027,590	Nickel	$138,010,542
Copper	49,947,080	Pig Iron	78,925,917
Gold	50,864,863	Cobalt	5,918,899

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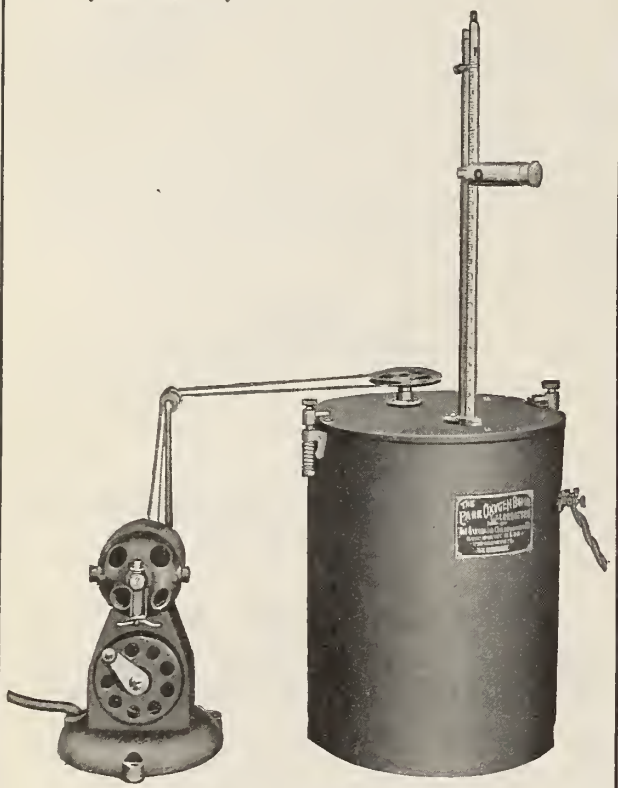

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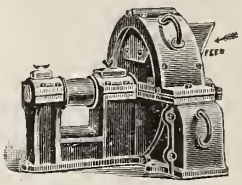

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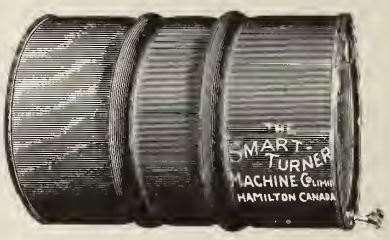

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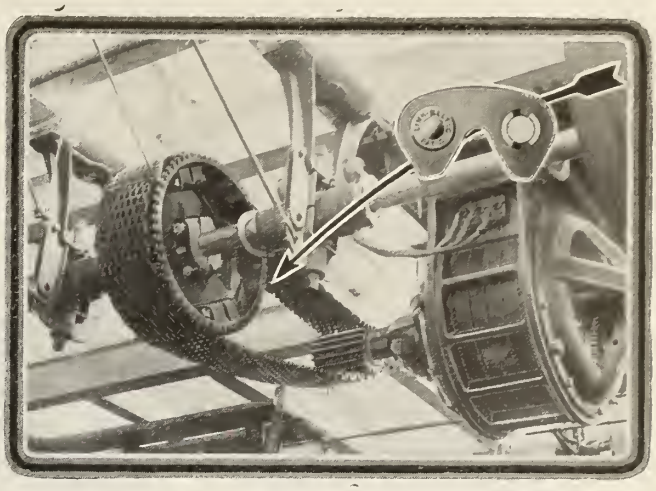

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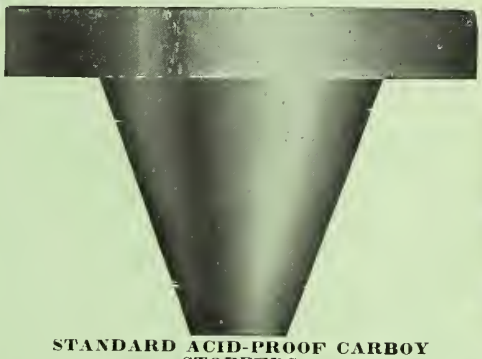

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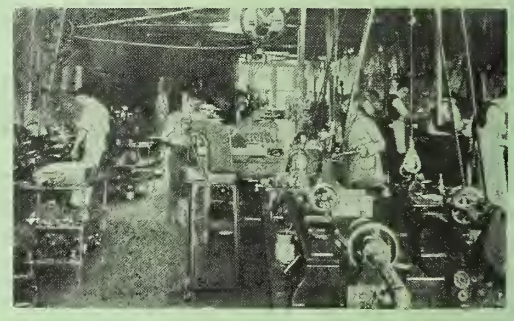

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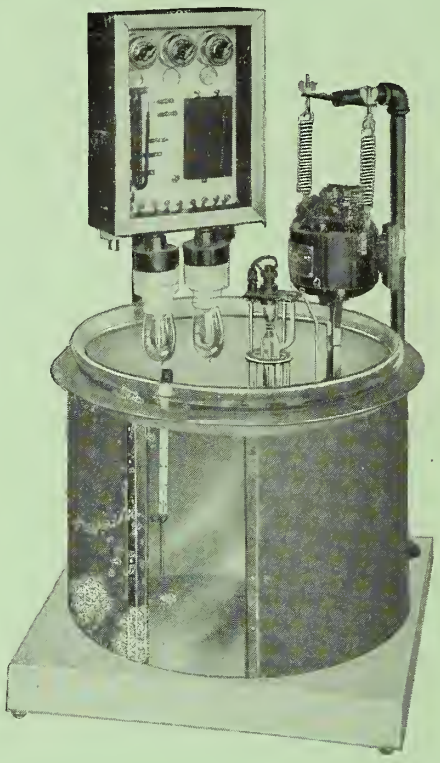

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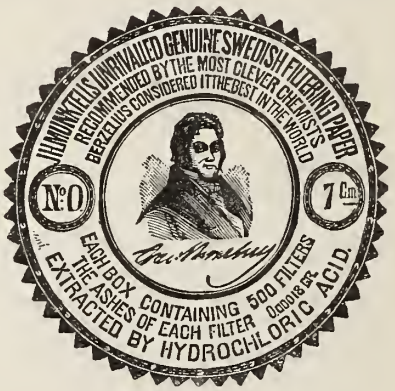
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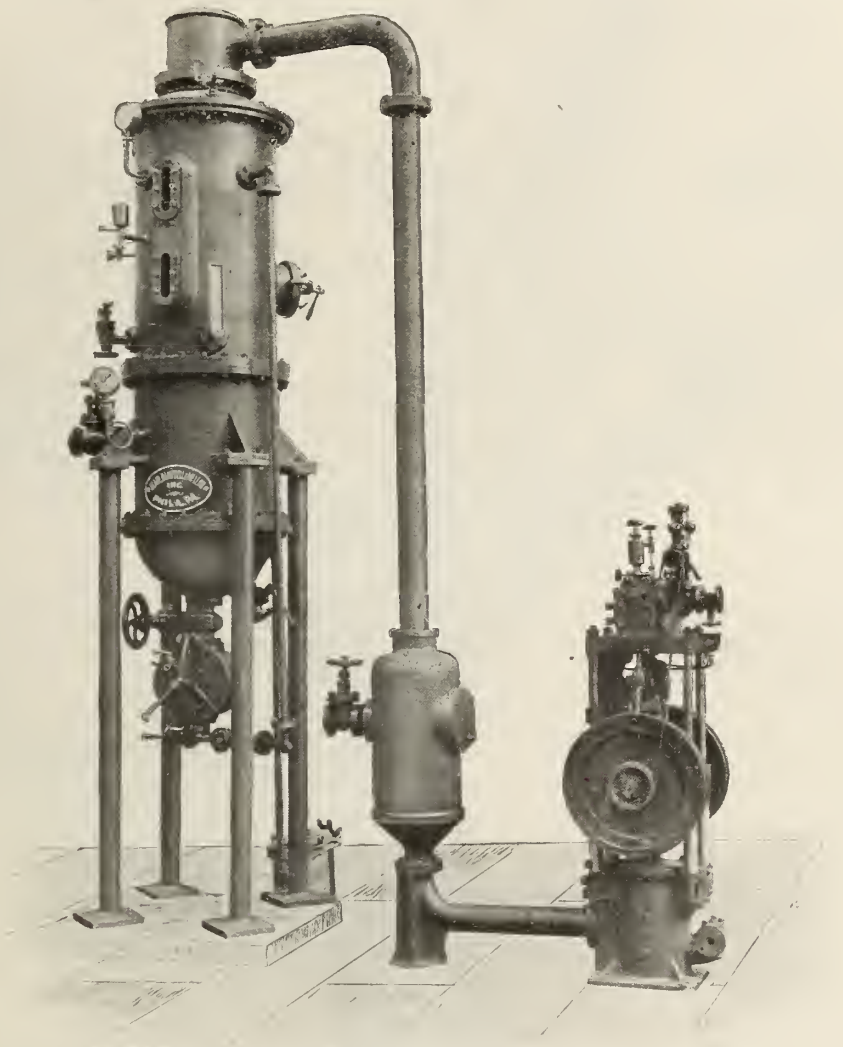

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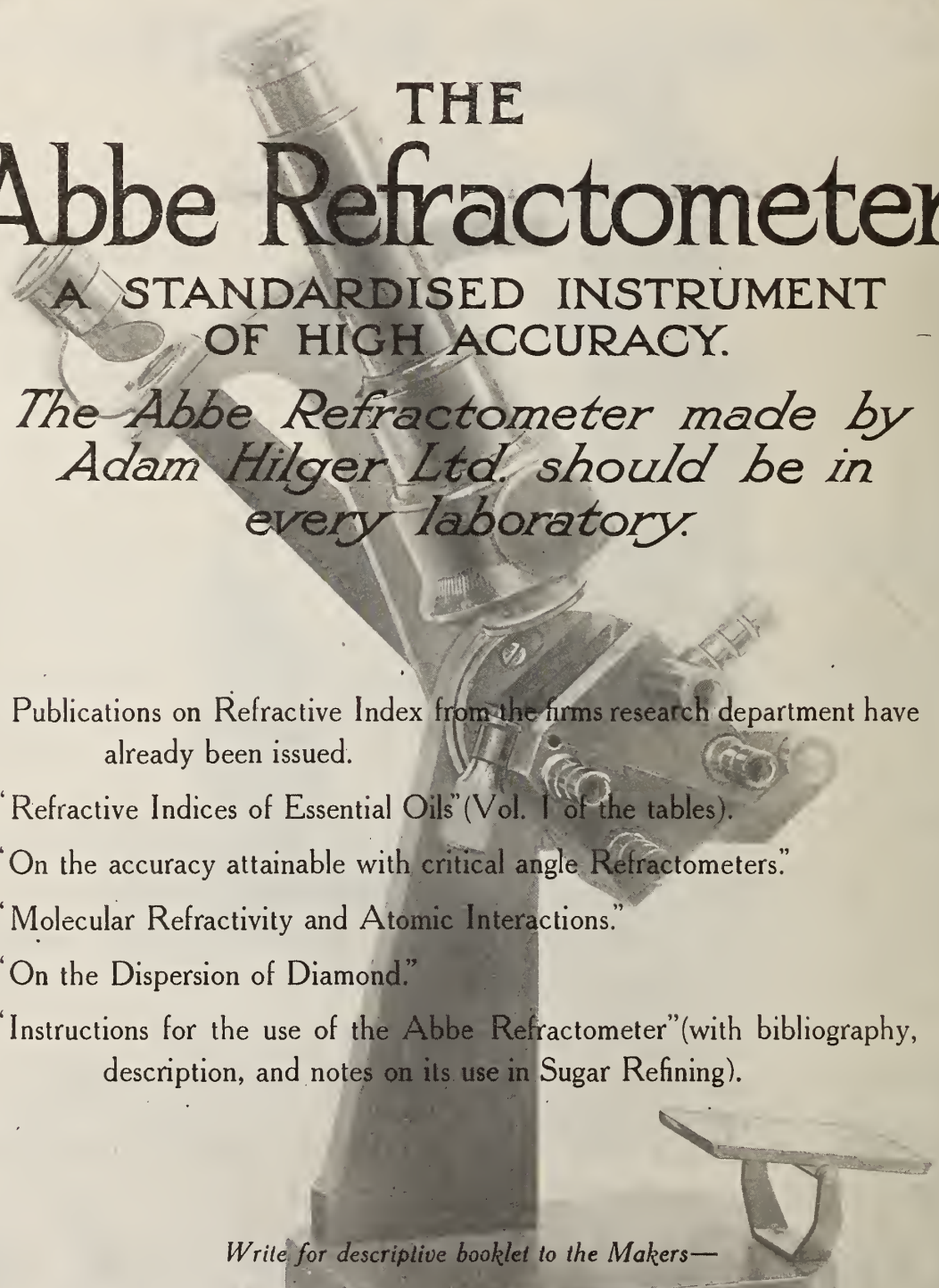

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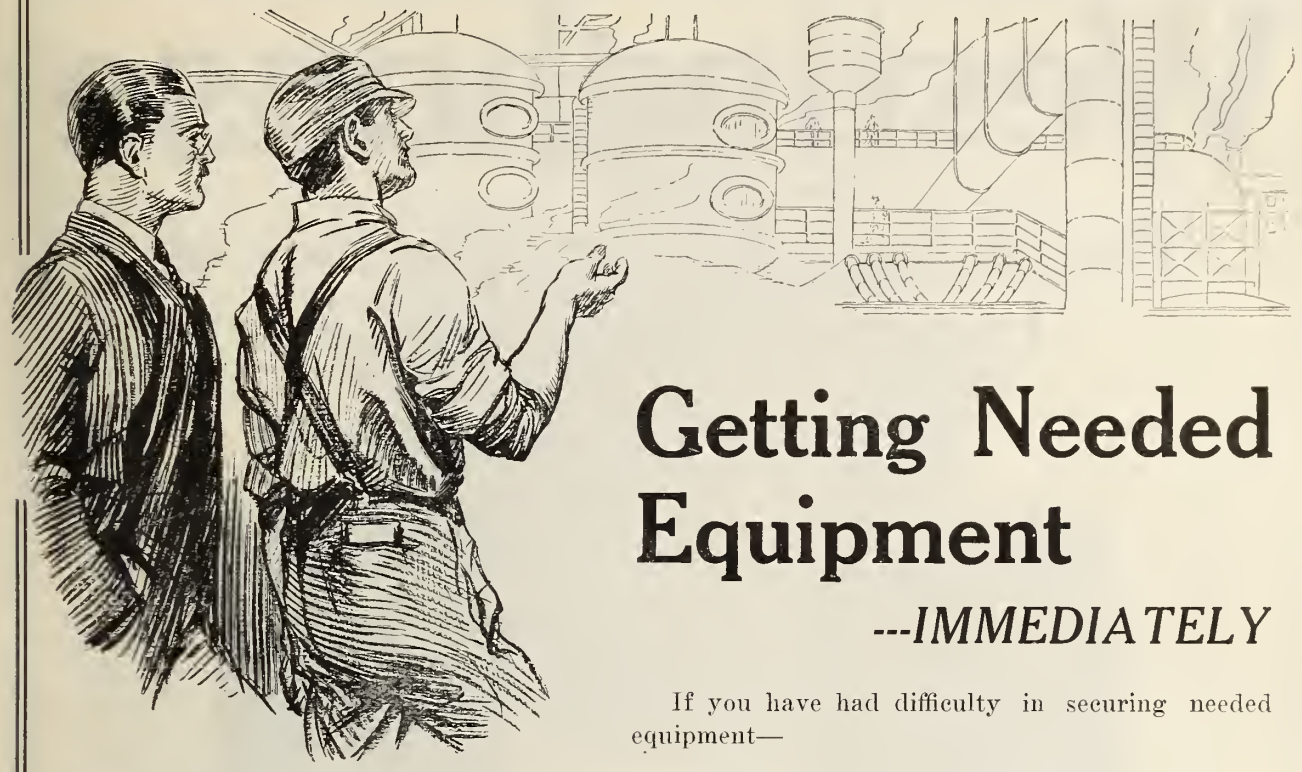

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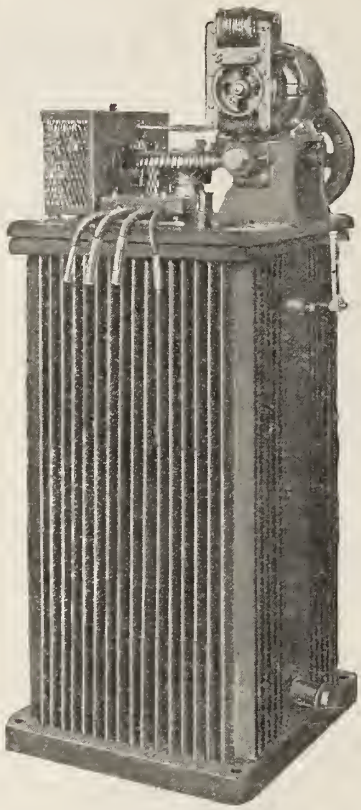

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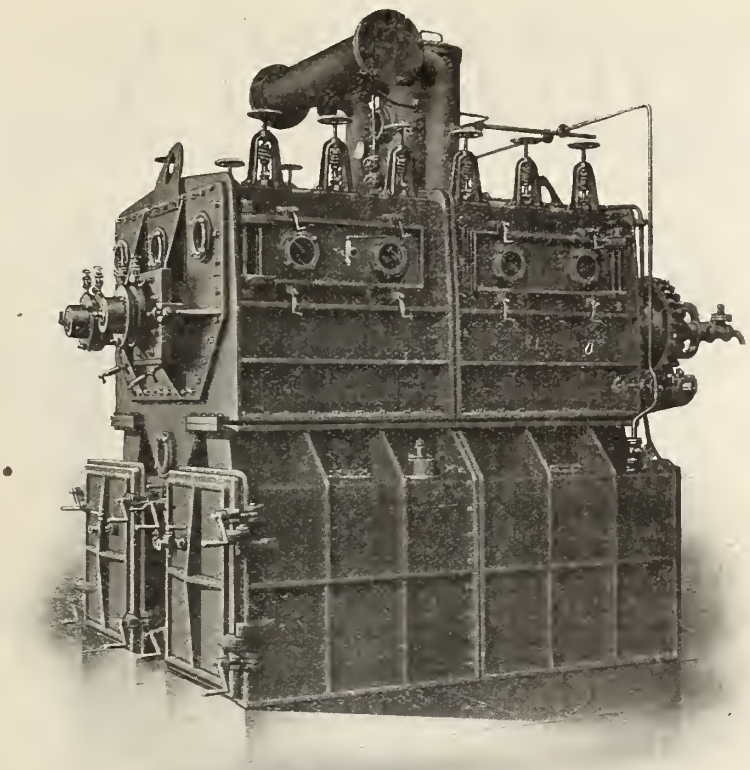

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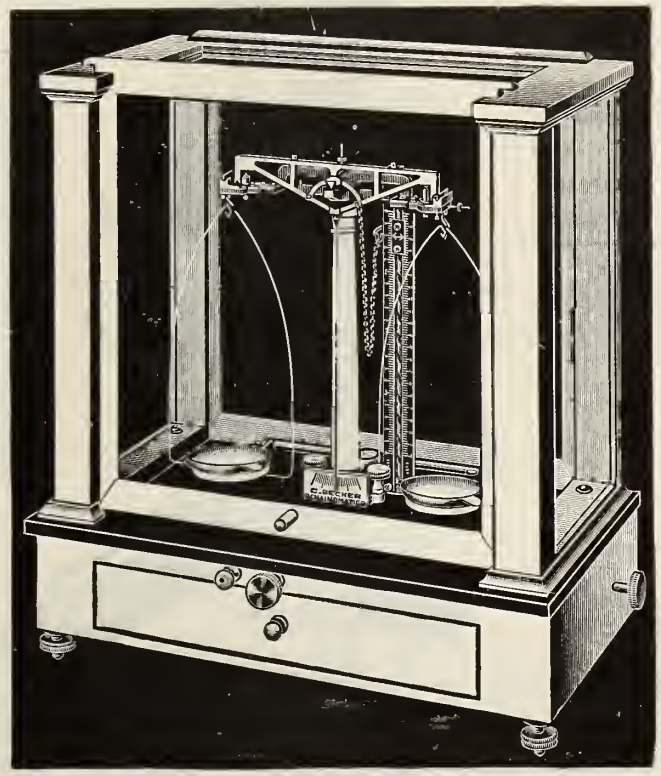

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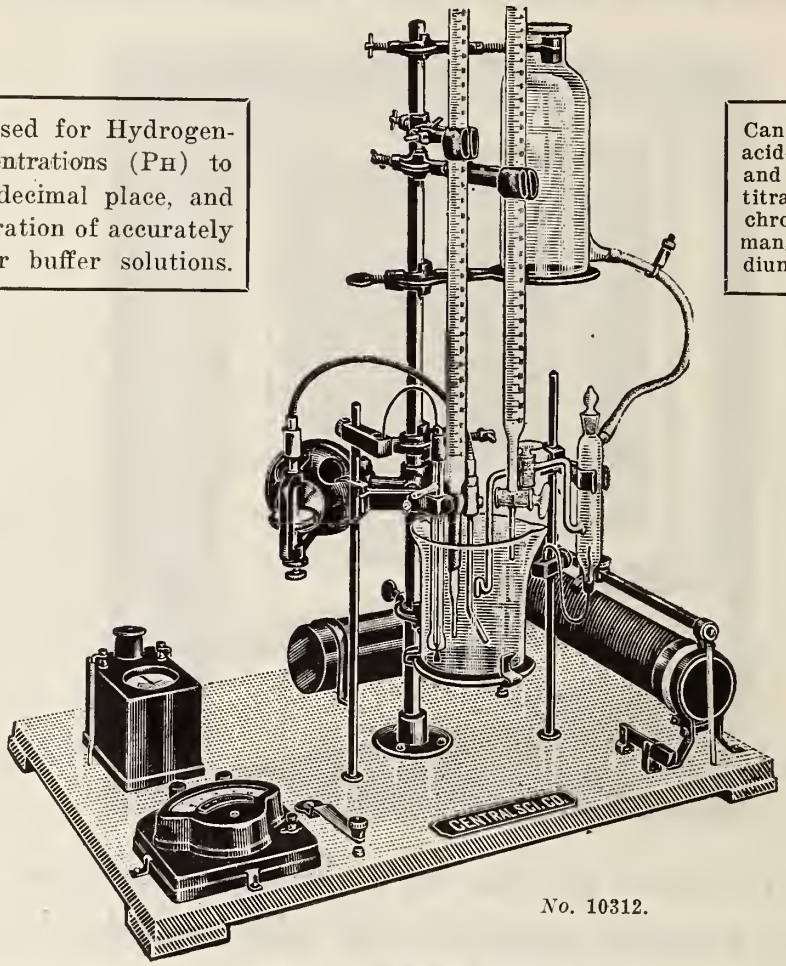

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Vol. XXXVIII, page 341 (1916)
Vol. XLI, pages 1337-1357, 1358-1362, 1776-1782 (1918)

Journal of Industrial & Engineering Chemistry:
Vol. VIII, page 718 (1916)
Vol. IX, pages 668, 780, 941 (1917)
Vol. X, page 19 (1918)
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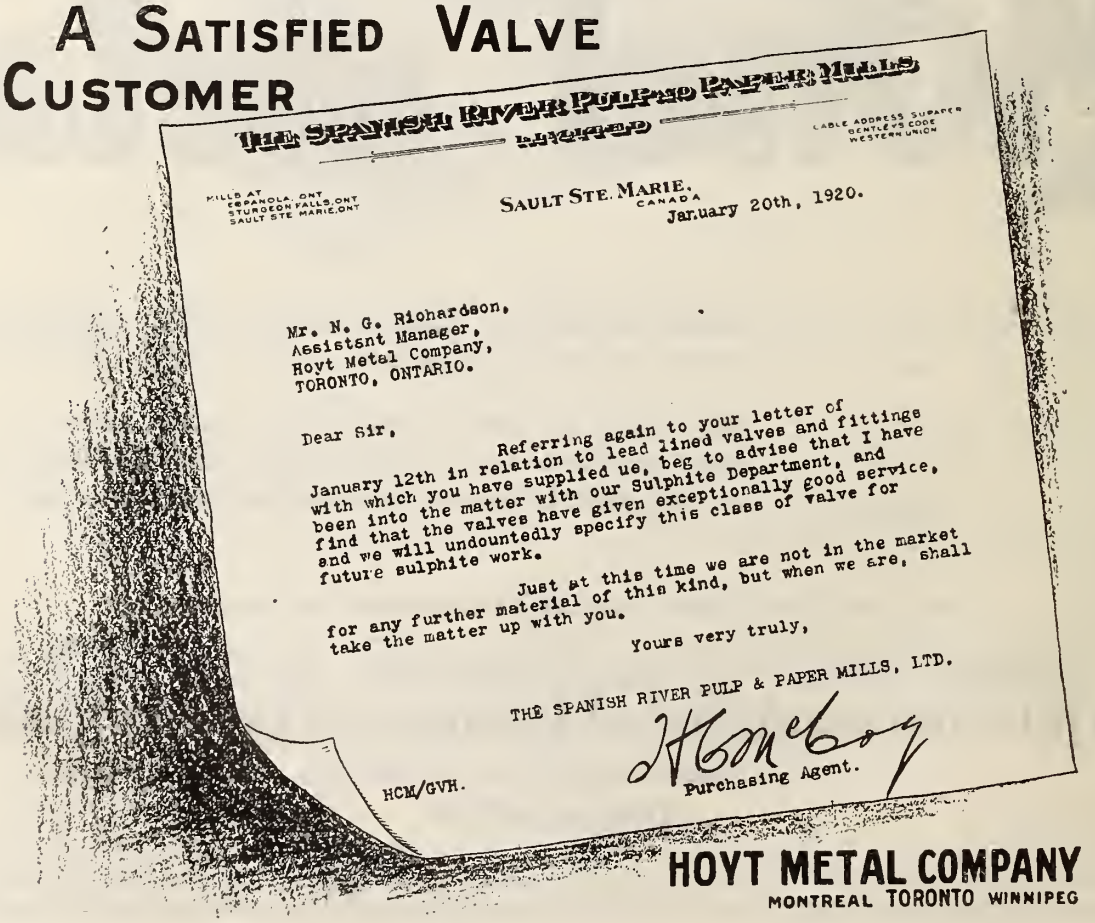
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CANADIAN CHEMICAL JOURNAL

A Canadian Journal devoted to Metallurgy Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

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EDITORIALS

COMPETING WITH RHINE INDUSTRIES.

THE question of supreme interest among British chemical men to-day, both works chemist and company director, judging from reports of recent English chemical societies, appears to be whether or not Great Britain, after her successful emergence from a war with German military efficiency, is going to be able to hold her own industrially against the great and highly efficient chemical plants along the Rhine. And such, indeed, may well be the uppermost problem in the minds of the scientific men of the United Kingdom, for the answer is not readily heard.

Though we are now entering our second post-bellum year, though Heligoland is being dismantled and stripped of its fortifications, though the German fleet lies, for the most part, beneath the waters of Scapa Flow, yet industrial Germany has still to be reckoned with, and we venture to say not a single British man of science can be produced who would declare himself as optimistically facing the competition of German industrial plants, particularly those chemical, with those of his own country—certainly not under present conditions or present methods of controlling and managing British industry.

This is not a state of fear, of cowardice, or lack of faith in British industry. It is simply the result of a square facing of the facts. At a recent meeting of the London section of the Society of Chemical Industry, this whole matter was discussed, and two excellent addresses were given by Mr. E. V. Evans and Dr. G. S. Walpole, both of whom had but recently returned from a survey of the chemical plants in Germany. Dr. Walpole compared the collective organization of German chemical plants with the lone-hand idea played by British firms. To this splendid team work of German companies, Dr. Walpole had no hesitancy in giving their supremacy in the commercial field. We quote here a few sentences from Dr. Walpole's address, as they are full of meaning to the future of British, yes, and Canadian, chemical industries:

"The picture conjured up by the German chemical industry to-day is team work in its highest development. One notices everywhere not only the most stringent economy of materials and men, but also the lavish expenditure of capital on plants designed to work with the minimum of attendance. It was as rare to see a man shovelling anything as to see a waste product. The power of the German chemical industry lies in its policy of united effort extending to its control of every detail of their programme. A logical consequence of good staff work was the organization of an industry as one big, self-contained industrial body. It required the abolition of useless competition amongst its parts, whereby one product is made in a small way in a number of little works, whereas another badly-needed intermediate is not made at all and must be imported.

It is the Army and the Aliens Bill and certain protectionist legislations that stand between us and the extinction of synthetic chemical industry here. Now, the shielding influence will one by one be withdrawn, and trench warfare behind barbed wire will develop into battles in the open—, but the whole issue will depend upon the collective action of the big chemical interests in this country, and upon their 'staff work.' If they get together and develop on lines of mutual help and support, we can stand up to the great organizations with which we will have to compete."

So there you have it—"collective action." Upon that depends mainly the successful outcome of British, and, as we said above, of Canadian chemical industries too, with products from the Rhine plants. To collective action must be added, as Mr. Evans emphasized in his address, the discovering of new lines of progress and the putting of more faith in and the spending of more money on research. If these things are not done, and, moreover, if they are not commenced very shortly, perhaps one should say immediately, it will be only a matter of time before Germany regains her supremacy not only in the chemical industry, but to a large measure in iron and steel and other industries as well.

INDUSTRIAL EXHIBITS AT CHEMICAL CONVENTION.

IT has now become a question whether or not Canada has progressed far enough in the development of chemical industries or does sufficient business in the sale of the industrial chemicals, special apparatus and machinery, to warrant the holding of a Canadian Exposition of Chemical Industries. This could either be held in conjunction with the spring annual meetings or might become a part of the industrial display at the Toronto Exhibition.

It will be remembered by some that at very short notice a few companies were able to prepare very simple displays for the Convention of Chemists in Montreal last year. Those companies taking part in this hurried effort took advantage of a new oppor-

tunity to become better acquainted with technical men, to the general advancement of their business.

The Society of Chemical Industry does not function as an organization specially designed for this purpose, but undoubtedly would be willing to co-operate with its organization. The Canadian Institute of Chemistry, in the direct interests of its members would naturally support the movement. It remains, however, for those companies who are actively engaged in selling chemicals, dyes, apparatus, instruments and machinery on the Canadian market to gauge this opportunity for themselves. The Industrial fairs of European countries and the great success of the chemical expositions held at New York and Chicago would indicate that this is one of the best methods of stimulating business and eventually would be considered by all concerned as the right time and place to transact a considerable amount of the business of the year.

What was done in 1919 can at least be duplicated and increased in 1920, if it is the desire of manufacturers and dealers to co-operate with those having the business of the Annual Convention of May 27 and 28 in hand. While facilities for extensive displays are not likely to be available, the cost of such an effort on the part of any firm would practically amount to the cost of packing and transportation. While it might not be advisable or possible to attempt an expensive display of machinery, there will be opportunities presented for representatives to interest the chemists, technical men and engineers who will be on hand.

Full details of the facilities available will be gladly supplied by this Journal.

MARGARINE OR POLITICS.

UP to the year 1917 margarine was an unknown article of food in Canada, the farmers and dairymen objecting to it as a competitor of butter. In 1917 an Order-in-Council was enacted, allowing the manufacture, import and sale of margarine, as a war measure. In the interval, Canadians have learned to appreciate and value margarine as a wholesome article of food, but unless special legislation is introduced at the coming session of Parliament, margarine will again be prohibited. This latter calamity seems likely to take place unless strong representations are made to Parliament by the consuming public, and some steps taken to offset the natural opposition of the dairy and farmers' interests.

Margarine is a recognized article of food in all other countries, and it is doubtful if another example can be given, of a Government, excluding from its border, a staple and valuable food, instead of leaving its use to the judgment and good sense of the community.

In the last two years the consumption of margarine in this country has grown to about sixteen million pounds annually.

There is no question as to the wholesomeness of margarine, and the sanitary conditions under which it is manufactured. It offers to the consumer a substitute for butter, selling at a little over half the price of butter, and to people of small means it is the only satisfactory spread for bread obtainable, as the price of butter becomes prohibitive. It will never take the place of butter for those who can afford butter, but it should not be denied to those who are not able to pay for a higher-priced article.

The opponents of margarine argue that its sale will reduce the value of butter and make the manufacture of butter unprofitable. The last few years have not seen any reductions in the price of butter despite the sale of the margarine. Undoubtedly conditions have been abnormal, but under normal conditions the price of butter in this country is controlled by the export market, and in the export market, for example—Great Britain and the United States—butter has to compete with margarine.

Margarine consists essentially of a mixture of fats blended together to have a melting point approximately the same as that of butter. To get a satisfactory flavor only the purest of fats and oils can be used, and commonly a small percentage of butter or milk is worked into the margarine to give it a butter flavor. Margarine can roughly be divided into two classes, those containing animal fats mixed with vegetable fats, and those containing vegetable fats only. If animal fats are used, these consist principally of oleo and lard oil. The vegetable fats used cover a large range and may be hydrogenated fats or otherwise. Two of the best known oils used are cottonseed oil and cocoanut oil. All margarine manufactured on this continent comes under close Government supervision, thus insuring the most sanitary conditions. Quite apart from the Government inspection it is impossible to produce a good margarine, except from the finest of fats.

It has already been mentioned that at present there are two plants manufacturing margarine in Canada. Undoubtedly, but for the present unsatisfactory status of the industry, other plants would have been in operation. These in turn would stimulate the edible oil refinery industry and develop the manufacture of the hydrogenated fats.

An attempt has been made to give a brief outline of the margarine situation in Canada. It is to be hoped that all chemists will exert what influence they can to see this issue squarely met. The question of the manufacture of margarine and its sale in Canada should be settled on the merits of the case

alone, and legislation should not be allowed to stand which caters in such a matter to any particular interests, when a fair examination of the situation would show that the sale of margarine will not become a factor governing the price of any commodity to the dairy industry.

Having the positive practical experience of the larger countries in the world to guide us in this matter, no Government should hesitate to give this food product a fair and equal right to compete, leaving the Canadian consumer to judge. The practical thing to do is for the Dominion Government to make permanent such legislation as we now possess regarding the sale of this food.

A CALL TO INDUSTRIES TO UTILIZE THE WORK OF CANADIAN CHEMISTS.

The Editor, Canadian Chemical Journal,
72 Queen St. West, Toronto, Ont.

Sir,—Now that so many men are entering the Universities it behooves the University authorities, the students themselves, and those interested in the future development of the country, to consider how the training received can be best utilized in the reconstruction period.

It has been considered that so many have been killed off by the war that there must necessarily be employment for those that are left. Indeed, from one point of view, it is incumbent upon survivors to work harder in order to make up to the world the losses which it has sustained. Men who would have attained great prominence in statesmanship, literature, art, science and industry have been cut off, it behooves those who remain to see to it that in some measure at least their loss is compensated for.

The war has influenced the choice of career that men are making. The fact that dentistry played such a part in fitting men for service in the war has doubtless given this branch of surgery a decided stimulus, and many young men are taking it up as a profession. I was told by a prominent dentist who served overseas, that the Canadian force would have lost 40,000 men from its strength had it not been for the work done by members of his profession. It is expected that the development in China and Russia will make openings for mining engineers in particular, as well as for civil engineers of various kinds. Chemistry has played such an important part in the war that it is assumed that all the world knows the value of chemists, and that it will be hardly possible for the Universities to turn out too many of them. Doubtless the world does now appreciate the work of chemists more than before. We hear of research on all sides, and from the glib way the newspapers talk about research carried on during the war, and research that will be carried on in the future, one might think that all that is needed is a little necessity in order to produce researchers by hundreds, if indeed not by hundreds of thousands, and they give the idea that there will be plenty of work for all prospective researchers. It is true that in Britain and Canada, where research has hitherto been little encouraged, there is now an impetus in that direction, and University instructors and students must realize the importance of cultivating research ideals.

It must not be assumed, however, that there is going to be lots of work for everybody. It is more important than before that men who graduate from our Universities should go out well equipped and trained to use common sense, and should be imbued with a spirit for work.

The standard that our students set for themselves should be higher than seemed necessary in the past; and while they prepare themselves for their work, it will be well, on the other hand, to see to it that there is work for them to do.

It seems to me that chemists of high and low degree, University professors and students, men who have already gained position as chemists in the industries, and men who are just beginning to enter the field, should carry on a propaganda in behalf of the claims of chemistry in the development of the country.

I was told by the head of a prominent drug company that in Canada manufacturers will not employ chemists, until they see that in competition with others they are losing. It is useless for Canadian manufacturers to ask us to buy their goods if they can be got more cheaply from Britain, or from the United States, or even from Germany. The natural course for manufacturers is to urge the Government to put on higher duty, but if they could be shown that chemists costing four or five thousand dollars might enable them to save $10,000 or $30,000 or $50,000, they might realize that it is better to make their profits by economic production rather than by attempts to get higher prices from their neighbors. Any money made by obtaining better service from Nature is immensely preferable to money squeezed from the laborer on the one hand, or the consumer on the other. Chemists can enable better service to be obtained from Nature. It is important that our students be trained with a special view towards this end; and then it is important that in all ways, in season and out of season, the public should be made familiar with the value of the chemist as a preventor of waste, as well as an inventor of new and cheaper processes.

I shall be glad if The Canadian Chemical Journal can bring together the forces of our chemists. I shall be glad to see in our our Universities each of the students who are taking up chemistry as a profession a subscriber to the Journal; then I should like to see the Journal a source of inspiration to these men and a means of bringing them into touch, through the advertisements and otherwise, with industries where chemistry is involved. With a larger circulation and a larger advertising list, a continually increasing number would become interested in carrying on a propaganda that I believe should be carried on through the daily press, which meets the eye of everybody, so that farmers and manufacturers and those engaged in industries of all kinds in which chemistry could help, would come to know of the value of chemistry, and would be ready to employ chemists, either continuously in their works or as occasion might require.

Let us provide good chemists, let us secure good work for them, and may the remuneration correspond with the work.

I am,

Yours truly,

JOHN WADDELL,

Faculty of Science, Queen's University,
Kingston, Ontario, Feb. 17, 1920.

The Maple Sap Industry*

By J. F. SNELL, Macdonald College, Que.

IN the northeastern quarter of the North American continent occur several species of maple trees whose sap can be concentrated to a saccharine syrup or, further, to a crude sugar of a characteristic flavor much enjoyed by those accustomed to it. On account of this flavor, due to some substance as yet unidentified, this crude sugar commands a price considerably higher than that of refined sugar. Maple syrup and maple sugar are to be classed rather as sweetmeats than as staple foods.

Chief among the sugar-making species of maples is *Acer saccharum, Marsh*—the hard maple, rock maple or sugar maple. This tree, besides yielding the best of sap, produces a most valuable wood, strong, hard, tough, heavy, and sometimes beautifully grained. Landscape, bird's-eye and curly maple are among the handsomest of veneer woods used in the manufacture of household furniture and in the panellings of railway carriages. Hard maple wood also finds use in shoe lasts, shoe pegs, saddle trees, wagon axles, in the frames of agricultural implements, in saw frames, in flooring and in wooden bowls. As raw material for the wood distillation industry and as household fuel, no wood is more valued than the hard maple.

Equal with *acer saccharum* in the quality of its sap, but rare in Canada, is the closely related *acer nigrum* (Michaux). *Acer saccharinum L.*—the soft or white or silver maple—and *acer rubrum L.*—the red maple—are also tapped for sugar, especially in districts where the sugar maple is not abundant, but not only are their saps poorer in sugar but their barks contains pigments which discolor the sap.

Extent of the Industry.

Maple sugar making is practised more or less from Arkansas, Tennessee and North Carolina to the northern limit of occurrence of the tree in Northern Ontario and Quebec and from Manitoba and Kansas to the Atlantic Ocean. Of the United States outupt, the four States of Vermont, New York, Pennsylvania and Ohio claim about eighty per cent.; the States in the second rank of production being Michigan, New Hampshire, Indiana, Wisconsin, Massachusetts and Maine. In Canada about 98 per cent. of the production is in the Provinces of Quebec and Ontario, the remaining two per cent. being practically all in the Maritime Provinces, Manitoba producing only 645 pounds in the last census year (1910).

At the last census Quebec's production was some nineteen million pounds, Ontario's a little over seven million. In the decade which has ensued Quebec's production has increased. According to figures furnished me by Mr. C. Vaillancourt, of the Provincial Department of Agriculture, it amounted to 27,527,430 pounds in 1918 and to 25,394,425 pounds in 1919. At prices prevailing in 1919 the value of the crop would be not far short of six and a half million dollars. If we take Quebec's present production as 26 million pounds and add the amounts produced in Ontario and the United States a decade ago, we get 78 million pounds as an estimate of the total annual production of maple sugar.

Early History of Sugar Making.

The maple industry dates back to the pioneer days of French and English settlement in North America. No doubt the Indians knew of the sweetness of maple sap, and it seems probable that they had made small quantities of the syrup and sugar. Sy tells us that the Ojibwa word for maple sugar means "drawn from wood (or tree)," and that some tribes had spring festivals known as "maple dances." Having no metal vessels the Indians certainly did not develop anything resembling an established industry. Early literary references to the sap and its products do not imply that syrup or sugar was made in quantity. Indeed, the earliest references refer only to the sweetness of the sap.

Frere Gabriel Sagard in 1623 writes of the Hurons hacking the "beeches" and drinking the sap. In 1663 Robert Boyle writes quaintly: "There is in some parts of New England a kind of tree whose juice that weeps out of its incisions, if it be permitted slowly to exhale away the excess moisture, congeals into a sweet substance." In the same year Pierre Boucher writes of the maple tree, referring to its strong wood used for fuel and for implement handles, and adding: "When one notches these maples in the spring a sap drips out which is sweeter than sugared water, or at least more pleasant to drink."

The French-Canadian historian, Benjamin Sulte, who maintains that the industry originated among the French about 1685, has had the archives of France searched for references to maple sugar previous to that time, and has found nothing except an announcement by the Colonial Minister in 1671 that settlers who sent sugar to France would be granted a rebate of taxes, and this may well have referred to cane sugar from the West Indian colonies. Neither Talon, nor Frontenac, nor any of the other Intendants and Governors between 1665 and 1695 mention the product in any of their reports. La Honten in 1685 mentions the making of maple sugar and syrup—so precious that no medicine has ever been found more efficacious to fortify the breast ("On fait de cette sève du sucre et du sirop si précieux qu'en n'a jamais trouvé de remède plus propre â fortifier la poitrine"). But he adds that few have the patience to make it, and scarcely any but children tap the trees.

It is to Dr. Michel Sarrazin that Sulte is disposed to assign the honor of having established the making of maple sugar as an industry, basing his claim upon a memoir communicated to the Académie Royale des Sciences, an abstract of which was published in the Histoire de l'Académie Royale des Sciences in 1730 (p. 65).

Sarrazin came out to Canada in 1685, returned to France in 1694, and died in Quebec in 1734. The abstract states that Sarrazin had sent to the Jardin royale four species of maples from America to which he had given names. The fourth—which he named *Acer Canadense Sacchariferum, Fructu Minori, Dr. Sarrazin*—was a tree 60 to 80 feet in height. Its sap, rising between the first of April and the middle of May, was often saccharine, a fact well known to both the Indians and the French. From an incision made in the tree the sap flows out into a receiver, and upon evaporation there is left a twentieth of its weight of a true sugar suitable for use in preserves, etc. One of these trees, three or four feet in circumference, was capable of giving sixty to eighty pounds of sap a season without suffering injury. More might be drawn, but it was

*Address delivered by Professor Snell before McGill Chemical Society, Montreal, February 13, 1920.

clear that this would weaken the tree and hasten its aging.

To render this sap saccharine circumstances were requisite which one would never guess: (1) It was necessary that at the time of tapping the foot of the tree should be covered with snow, and if no snow were there some must be brought; (2) it was necessary that this snow should be melted by the sun and not by warm air; (3) there must have been frost the preceding night.

Sarrazin, or his editor, remarks sagely that this kind of manipulation which Nature employs to make maple sugar resembles some chemical operations where one does things which appear inconsistent (opposées), and where those which appear most similar are not equivalent in effect. The sap of such a maple, which would not be good to make sugar, becomes so within a half hour or an hour after the snow begins to melt. The snow is carried into the vessels (tuyaux) of the tree and operates there with great velocity.

This account of the sugar maple is correct enough as far as facts are concerned, and the naivity of the theoretical comment may be the editor's rather than Dr. Sarrazin's. Nevertheless, it does not establish a claim to the inauguration of the industry by the learned author. What it does indicate is that sugaring was practised in his time. This is confirmed by Pere Christian le Clerc, who, in his "Nouvelle Relation de la Gaspésie," mentions the making of maple sugar, cakes of which were sent to France as curiosities, and which was often used in place of French sugar.

That in Acadia in 1699 maple sap was boiled in kettles to syrup and sugar is shown by the writings of Le Sieur de Diéreville, who sang the praises of maple sap in verse and described the collecting and concentration of the liquid in prose. The sale of maple sugar by Indians of the Iroquois Confederacy was mentioned in a report of Gedeon de Catalogue in 1712.

In 1715 Pere Lafitau not only describes the Indians making syrup, but gives a picture of the process, in which kettles are used. He also says the French make it better than the Indians, from whom they have learned.

Development of Industry.

From these small beginnings the industry has developed to its present magnitude of from thirty to forty thousand tons a year. Apparently it has almost reached its maximum, though the census figures do not furnish ground for the frequently expressed opinion that it is dying out. If extinction were overtaking the industry one would expect this to become evident first in the United States. While it is true that the 1900 census shows a great falling off in production from preceding census years, it must be remembered that the production varies greatly from year to year, and that the 1870 census also shows a low production, while the 1909 census shows a figure not alarmingly lower than those of 1860, 1880 and 1890. In millions of pounds total production (sugar, and sugar equivalent of syrup) the figures are: 1850, 34; 1860, 51.5; 1870, 35; 1880, 49; 1890, 49; 1900, 27; 1910, 45.

The Sap.

The primitive method of tapping was to gash the tree with an axe. The modern method is to bore one or more holes, one or two inches deep, with a three-eighths to one-half inch bit. Into the hole is driven a metal spout, which usually carries a hook, upon which a bucket is hung to catch the dropping sap. That the flow of the sap is caused by an internal pressure has been established, but the nature of this pressure has not been made clear. Experience shows that the best runs of sap are obtained on moderately warm calm days, following frosty nights. Sap will flow in such weather at any time of the winter, but it is only in the early spring that such weather is at all frequent.

The Indian drew his maple sap through wooden spouts, collected it in wooden troughs, and probably boiled it in wooden or earthen vessels by throwing in heated stones. Wooden spouts, buckets, and gathering and storage tanks are not yet entirely discarded, but the up-to-date sugar-maker uses no vessels but those of heavily tinned iron. Experience has shown that the sap keeps better in metal vessels of this kind, and the bacteriological investigations of the Vermont Station have made clear the reason.

Maple sap is a dilute aqueous solution of sucrose, salts and albumin. Such a solution constitutes an ideal culture solution for micro-organisms, and the sap is subject to nearly as many and as diverse diseases as is milk. Drawn from the tree and stored under aseptic conditions maple sap will keep perfectly for years, even with free access of air. But in practice it becomes more or less infected with bacteria, and moulds and deteriorates rapidly in such a manner that the best grade of syrup can only be made by boiling the sap the day it is drawn from the tree, or at latest the following morning. The most common forms of organisms present in maple sap, it appears, are the fluorescent bacteria, and these affect the color rather than the flavor of the sap. The non-fluorescent spore-bearing bacteria and the moulds do not seriously darken the color but injure the flavor, and in many instances render the sap turbid. Certain specific organisms, believed to be new species, render sap stringy and affect the flavor and clearness like the moulds and non-fluorescent bacteria. Sap affected by any of these diseases is popularly termed "sour," although its acidity is, as a rule, not more than normal.

It has long been realized that high-grade syrup cannot be made from the sap obtained towards the end of the sugar season. "Last-run" goods are often very dark in color, and usually lack the delicate flavor possessed by the best syrups. Green sap is almost always secured just before the close of the season, when the leaf buds are ready to open. The term "buddy" is commonly applied to the flavor of this late-run sap. The work of the bacteriologists has shown that, while there is undoubtedly a deterioration in the flavor of sap, due to physiological changes occurring in the tree towards the end of the season, much of the trouble which has been designated "buddiness" is really due to the growth of micro-organisms, which naturally become more rapid towards the end of the season, when the weather is warmer. The advantage of metal vessels over wooden is therefore due to the superior cleanliness of the former. Covers on the buckets also make for cleanliness.

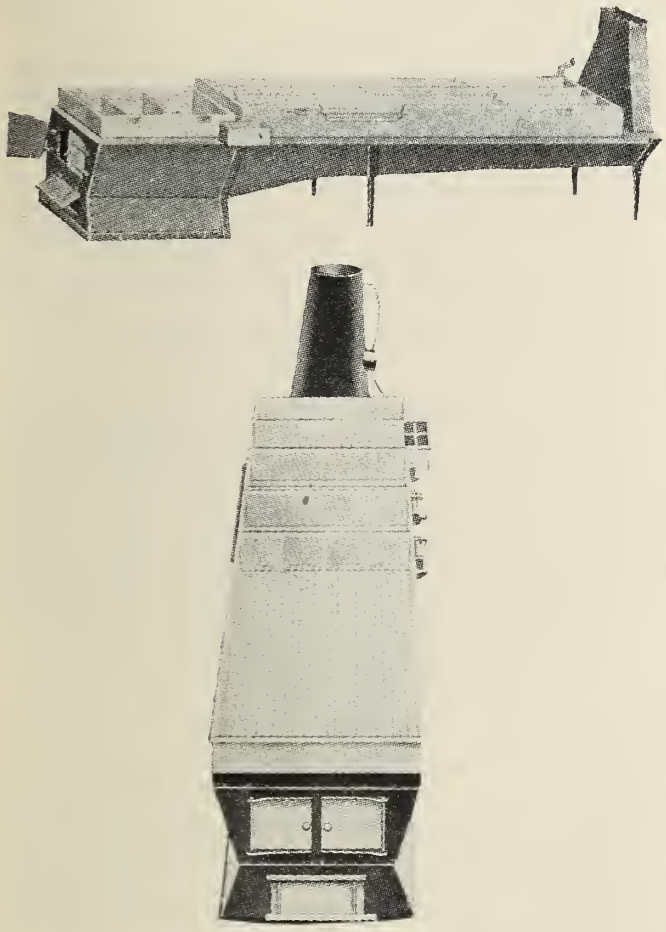
Equipment Used.

Modern "gathering tanks" for conveying the sap to the sugar-house are of galvanized or tinned iron, as are also the storage tanks from which the sap is run into the evaporators. In the best practice these storage tanks are in a covered shed on the north side of the sugar-house, so that the sap is kept cold while in storage tank.

The "potash" kettle, slung over an open fire, is still in use on not a few farms in Canada, but this primitive

method of evaporation is scorned by all who aspire to make goods of any but the lowest quality.

About half a century ago it began to be realized that a wider, shallower vessel would not only be more economical of fuel but would produce a better-colored syrup. The rectangular pans then adopted have since developed into the modern evaporators of heavy-tinned plate, having corrugated bottoms to increase the heating surface, and divided into compartments, from one of which to another the evaporating sap flows until it finally reaches the finishing compartments, which are placed in some types at the front and in others at the back of the fire. The



Types of Sap Evaporators.

evaporator stands upon an iron or brick "arch," in which the fire is built. Wood fuel is almost universally employed. Rapid shallow boiling prevents caramelization and yields a syrup of light color and of a milder flavor than that of deep-boiled syrup.

An Agricultural Industry.

Maple sugar-making has been from the first, and, so far as one can see, must continue to be, an agricultural industry. The fact that it is only a few weeks in the spring that sap can be obtained in quantity and of quality suitable for sugar-making, and that during those weeks the melting of the snow renders the roads nearly impassable, prevents the organization of the industry in a manner that would render it possible to use the highly economical evaporating apparatus which is employed in the beet and cane sugar industries. Multiple effect vacuum pans are out of the question for a single farmer, or even for the number of farmers that could deliver sap at a central station. The enormous amount of fuel consumed in evaporation at atmospheric pressure is apt to shock the sugar refinery man. With the most modern apparatus from seven to twelve cords of wood are used in the manufacture of a ton of maple sugar. But it must be remembered that the wood is close at hand and can be collected and prepared at very little cost. Coal is but little used, and if wood is eventually to be displaced as a fuel it is not unlikely that it will be liquid fuel, rather than coal, which will take its place.

THE GERMAN CHEMICAL INDUSTRY.

At a recent meeting of the London, Eng., section of the Society of Chemical Industry, the present position of the German chemical industry was outlined by Mr. E. V. Evans, of the South African Gas Co., who acted as chairman of a mission sent to the occupied area by the Board of Trade and the Association of British Chemical Manufacturers. After visiting the large chemical works of the Rhine Valley, including the works of the Boyer Company, Meister Lucius and Brunning, the Badische Arilin, the Soda Fabrik, and the Griesheim Electron, together with a large number of smaller works, the outstanding impression he had received, declared Mr. Evans, was that of a huge and highly efficient organization temporarily paralyzed. Plants known to be capable of supplying 80 per cent. of the world's requirements in dyes in pre-war years, were found to be in good state of repair, ready for operation, but lacking at the time of the visit the necessary raw materials and efficient labor. Such an immense industrial power could not, said Mr. Evans, be ignored. How assiduously the German had studied and applied scientific methods to the various branches of business activity was well demonstrated by the inspection of the plants, and this factor was of great importance in accounting for the success which these industries had achieved.

While not wishing to encourage the German bogey, it was necessary, said the speaker, to fact facts, and although high praise should be given to the efforts of British firms undertaking the manufacture of organic chemicals, it should be realized that the present attainment of Germany in chemical industry represented the work of forty years. It was a fallacy to say that the British firms had had five years to resuscitate itself, for the Empire had been at war, and the few firms which were allowed to continue the manufacture of colors were kept busy largely supplying the requirements in dyes of the fighting forces of England and other Allied countries.

While these huge organizations existed in Germany for supplying almost the whole of the world's pre-war dye requirements, Great Britain, Switzerland, the United States and France were doing their utmost, not only to become self-supporting in the organic chemical industry, but also to create a valuable export trade. In view of the fact that all these extensions were being made at a time when the cost of material and labor was so materially in advance of pre-war times, and that much of the German and Swiss capital had already been largely subscribed, Mr. Evans urged that immediate steps be taken by the British Government to ensure some form of protection to its organic chemical industry if it were serious in its desire to foster it and prevent the recurrence of a similar calamity to that in which Great Britain found itself at the declaration of war. The task was a stu-

pendous one, and required, in place of the few experts holding honorary positions on the Trades and Licensing Committee of the Board of Trade, a complete organization of experts, whose business it would be to obviate the importation of dyes required by users but not made in the United Kingdom. In building or extending plants at the present moment a great financial risk was involved, and unless a remedy for these difficulties was quickly formulated it could not be expected that much progress would be made in the manufacture of new products.

Recent Ore Concentration Developments by the Consolidated Mining and Smelting Company of Canada, Limited

By R. W. DIAMOND

The great advancement in the science of ore concentration by the oil flotation process in recent years naturally revived hopes, in many cases, for the successful treatment of ores by flotation which had formerly proved too refractory to the older gravity concentration methods and to the early undeveloped flotation processes. Such was the case with two of the largest properties of The Consolidated Mining and Smelting Company of Canada, Limited, namely, the low grade gold ores of Rossland, and the complex Lead Zinc Iron ore of the Sullivan mine at Kimberley, B.C. Tests were inaugurated early in 1917 for the investigation of treatments, especially flotation, for these and any other company ores which might warrant it.

Treatment of Sullivan Ore.

During the first year efforts were directed chiefly toward the solution of concentration treatment for Sullivan ore. An experimental mill of 250 tons daily capacity was built and equipped with concentration machines which it was known would effect some separation and which it was hoped, would successfully solve the treatment. These consisted of gravity concentration tables, magnetic machines, and one large minerals separation standard machine. Accompanying these, of course, were auxiliary machines such as ball mills, screens, thickeners, and filters.

The Sullivan ore is a finely crystalline complex mixture of lead, iron and zinc sulphides carrying only 3 to 6 per cent. insoluble. An idea of the intimate association of minerals can be had when it is known that grinding of the ore to 65 mesh liberates only 35 to 45 per cent. of the galena, and inspection under the microscope of 200 mesh material shows grains containing both galena and blende.

From a preliminary series of laboratory tests it was known that a good separation of zinc could be made from the lead and iron by flotation of the ground ore after it had been roasted at such a temperature as to almost completely oxidize the lead and iron sulphides, but to oxidize only a small percentage of the zinc sulphide. This roasting operation is commercially practicable due to the wide range between the roasting temperature of blende and that of iron or lead sulphide.

It was therefore decided to duplicate this treatment in the test mill. The roasting was effected in either the 25 ft. Godfry furnaces or the Wedge furnaces, and after cooling was subjected to flotation. It was demonstrated that a separation was possible but for practical reasons this process was abandoned. A long series of large scale concentration tests along a variety of lines was then made during which it was satisfactorily demonstrated that wet magnetic separation of pyrrhotite from blende was possible commercially. While most of the iron in the Sullivan ore exists as pyrrhotite, it is so feebly magnetic that the advantage of wet magnetic separation was questionable and it was not until a novel preparatory heat treatment for the ore previous to wet separation was suggested by Mr. C. Thom of the Concentration Staff, that its real possibilities were apparent. A complete series of laboratory tests were made and were so encouraging that an entirely new 150-ton test mill was built and equipped with special machines developed to suit our needs. This plant has since been increased to 250 tons daily capacity and is now about to start up at an increased capacity of 600 tons daily.

Laboratory preferential flotation tests have been carried on continually for effecting a separation of Sullivan ore into three products, namely: lead sulphide, zinc sulphide and iron sulphide. The results are very gratifying and success commercially to some extent is assured.

As a result of the long series of tests outlined above, a satisfactory treatment by concentration is possible for the Sullivan ore and this will consist of some combination of the following treatments all on finely ground ore:

(1) Table Concentration.

(2) Wet Magnetic Separation.

(3) Preferential Flotation.

Simultaneous with the above development, large scale flotation tests were inaugurated on the electrolytic zinc plant tailing. The leached tailing contains some zinc sulphide and flotation tests showed that this could be recovered and returned to the process advantageously. Accordingly two short M. S. machines were installed and are now in satisfactory operation.

Treatment of Rossland Ore.

The concentration of low grade Rossland ores has been given a great deal of attention. During the last twenty years, "The Le Roi No. 2" has milled a large tonnage of ore; their original treatment consisting of the "Elmore Oil Process." This however, was later converted into a simple gravity-table mill.

The Centre Star and War Eagle Companies did a great deal of experimental work on concentration and cyaniding following which the Rossland Power Company was formed, which built a large concentrator near Trail. This plant proved a failure largely because the treatment used in the tests was not followed in the mill.

The Le Roi mine also built a mill to work on low grade ore. This mill was later converted into a test mill by the Consolidated Mining and Smelting Company of Canada, Limited, where flotation tests were conducted for several months under Colonel Cruikshank at a time when flotation was still in its infancy in America. The tailing

from these tests contained enough gold to make cyanidation necessary. Good extractions were assured but the cost of milling and cyanidation was so close to the cost of smelting that this work was abandoned for a period.

Flotation of the Rossland ores was again investigated by Mr. John Bray at Trail in 1917 with results indicating that both flotation and cyanidation were necessary similar to those previously obtained at Rossland.

When the Sullivan concentration problem was fairly well solved, concentration of Rossland ores was investigated by the writer and it was found from laboratory tests that good recoveries were obtainable by a combination of flotation and tabling. The ratio of concentration however, was quite low. It was also found that fair recovery could be made with a much higher ratio of concentration by flotation treatment only, the recovery however, was such as to make the advisability of this treatment questionable. It is doubtful whether this work would have been continued had it not been for the fact that the original Sullivan experimental flotation mill was available and could fairly easily be adapted to the concentration of these ores. This mill was accordingly arranged with tables and flotation machines so that both could be used, or flotation only. Before the completion of the changes in the table installation in this plant, operation was commenced with flotation alone and from the outset as high a recovery was obtained thus as was obtained with both tables and flotation in the laboratory tests, and at the same time a much higher ratio of concentration was secured than if tables had been used. On the completion of the table installation tests were made for periods of a few days each using both treatments but with no additional recovery and with a much lower concentration ratio. Careful study of the flotation conditions since that time have resulted in the securing of a still higher ratio of concentration by flotation alone, still maintaining as good or better recovery. Fortunately a mill installation for this treatment will be cheaper and more simple in operation.

Plans are now being completed for a 1500-ton concentrator.

THE NEW HIGH-SPEED STEEL.

With respect to the reports of discovery by Dr. Arnold of a new high-speed steel in which no tungsten is used, Messrs. Darwin & Milner, Ltd., Messrs. Sybry, Searls & Co., Ltd., the Spartan Steel Co., Ltd., all of Sheffield, England, state that they have been manufacturing tungstenless molybdenum high-speed steels for some considerable time, and have given very great attention to the theory and practice of alloy steels generally. They fully endorse Dr. Arnold's view that molybdenum in high-speed steel produces far better results than tungsten, but dispute the claim that his formula is new, and also that vanadium has proved an efficient stabiliser of molybdenum when used with it. Not long after the introduction of tungsten high-speed steel (they state), molybdenum high-speed steel, both with and without vanadium, was made in the United Kingdom, France, Germany, Luxembourg, Austria and the United States, similar to the formula which Dr. Arnold has now made public. The occasional startling results of such molybdenum mixtures, superior to the very best tungsten high-speed steel, induced many firms to plunge into schemes for producing molybdenum steels on an extensive scale, but all had to be abandoned, because the resulting product lacked uniformity. Much of it was of excellent quality, but, on the other hand, batches of tools failed entirely when subjected to workshop tests, although they showed the correct analysis. In the cases where vanadium was added, it failed to be uniform in bulk manufacture, just the same as the molybdenum steel without vanadium, consequently the makers fell back upon tungsten. They attribute Dr. Arnold's faith in vanadium as a stabilizer to molybdenum steel to the circumstances that he experimented merely on small quantities. Only bulk production can disclose the presence or otherwise of a real stabilizing element. Mr. P. R. Kuehnrich, of Sheffield, who has the reputation of having carried out more tool steel alloying experiments than any living man, made the discovery that cobalt acted as a definite stabilizer to molybdenum, and he patented a formula to this effect. As the licensees under that patent, they state that they have made and distributed hundreds of tons of Como brand molybdenum super high-speed steel, and completely proved that cobalt is de facto a stabilizer. Como steel is now largely used in many parts of the world, and is thoroughly justifying the warranty advertised in the technical Press, guaranteeing it to produce results superior to tungsten high-speed steel. The molybdenum high-speed steel is more costly to produce than tungsten steel; users, however, are only too willing to pay the higher price, as the greater service the material renders makes it intrinsically the cheaper material.—*The Chemical Age, London, Eng.*

COMPANY NOTES.

That the new English interests lately become associated with the Dominion Steel Corporation were in co-operation with the Canadian management, with which there would be no interference, was the statement made by Sir Newton Moore, representative of the English interests, who recently visited the Dominion Corporation's plants at Sydney, Nova Scotia. Sir Newton said that production must be pushed to the limit, so as to decrease the costs of operation. "With the co-operation of Labor and the Governments, both Federal and Provincial, this can be effected readily, and all that will remain will be to find a market for our products," said Sir Newton. "With the association of prominent interests in Engand connected with the shipping and steel trade of Great Britain so recently effected with the corporation, we feel that this can be obtained, so that, taken altogether, the result should be mutually beneficial. We have invested several millions of dollars as proof of our confidence in what the future holds for the iron and steel and coal industries of the Dominion, especially in so far as the Dominion Steel Corporation is concerned."

PACIFIC COAST COMMENT.

The Commission of Industries for British Columbia is considering a plan to consolidate the several companies manufacturing steel from scrap iron in the Province, so as to place the industry on a well-founded and profitable basis.

A deposit of sodalite and lapis-lazuli has been located near Leanchoil, British Columbia.

Canada possesses 50 per cent. of the Empire's coal and 14 per cent. of the known resources of the world. Seven of the nine Provinces of the Dominion produce coal. Alberta being first and British Columbia second.—*Industrial Progress and Commercial Record, Vancouver, B.C.*

Manufacture of Butyl Alcohol

A Proposed Theory for the Mechanism of the Weizmann Process

By T. C. NEWMAN

DURING the past few months there has been a considerable amount of literature published on various aspects of the butyl alcohol fermentation.[1] The process variously known as the Fernbach or Weizmann process consists of the fermentation of media rich in carbohydrate, by a micro-organism, with the resulting production of butyl alcohol and acetone. The organism used is of the bacillus type, its spores are more resistant to heat than is usually found, and it may be isolated from various sources, by means of this property, and cultivated on carbohydrate media of various kinds. The products of the fermentation are acetone, normal butyl alcohol, ethyl alcohol, traces of higher alcohols, butyric and acetic acids, hydrogen, and carbon dioxide.

The observations upon which the conclusions drawn in this article are based were made on work done with the British Acetones, Ltd., Toronto, and the Commercial Solvents Corporation, Terre Haute, Indiana, both of which companies operated plants on the Weizmann process, using maize as the source of carbohydrate. From the work published, one would judge that the writers considered the chemistry of this fermentation to be of a new type. On the other hand, it is very probable that this fermentation is similar to ones that have been studied, and whose mechanisms are relatively well established, and the butyl alcohol fermentation can be explained in the light of this knowledge.

The chemical characteristics of the fermentation are a marked rise in acidity during the early stages of the fermentation, a maximum being finally reached and then an equally marked falling off in acidity. Six hours after inoculation a 10 per cent. maize culture shows an acidity varying from 1.3 to 1.8 degree, i.e., it requires 1.3 to 1.8 c. c. of normal alkali to render 100 c. c. of the medium neutral to phenolphthalein. This acidity rises till 10 to 12 hours later it varies between 5.0 and 6.0°. At this point the break in acidity comes and by the close of a normal fermentation it has fallen to 2.0—2.5°. The acids producing this acidity have been identified as acetic and butyric acids with small quantities of an unindentified acid[2], the proportions of these acids varying at different stages in the fermentation. The formation of acetone, a product whose rate of production is easily followed, does not take place in any considerable quantities till after the maximum acidity has been passed and the acidity begins to fall. Acetone formation then proceeds rapidly and evenly to the end of the fermentation. But, in cases of poor fermentations, towards the close part of the acetone may be used up, apparently to produce more acid. Likewise in the case of a poor fermentation, the acidity rises gradually to 5.5—6-0°, but instead of falling to 2° again, it suffers no more than a slight depression to perhaps 4.7—5.0°, if at all, and then mounts steadily to 8.0—9.0° and, on distillation, only traces of butyl alcohol and acetone are obtained.

In the Weizmann fermentation very little of the protein of the maize is used, showing that the carbohydrates are the raw material for the fermentation. There are, however, very small quantities of higher alcohols formed, amyl and even higher homologues have been identified. These alcohols are probably formed from the small quantity of protein utilized, by proteolytic hydrolysis, due to the micro-organism, the deaminization of the amino-acids thus formed, and their reduction to the alcohols, according to the theory of Ehrlich.

The above are the chemical facts of the fermentation and the following conclusions are drawn from them. The first step of course is the saccharification of the starch and its hydrolysis to glucose. This the organism does very rapidly and completely, a good fermentation showing no starch at all at the end. From glucose the next step is to butyric acid; this may properly be called the primary reaction of fermentation for, from all observations, the bacteria is first of all an acid former. This rearrangement might be considered to take place as follows:—

$$C_6H_{12}O_6 = C_3H_7COOH + 2\,CO_2 + 2\,H_2$$

Then, as in the yeast fermentation, as it is generally conceded[3] a portion of the methylglyoxal, or more probably the dihydroxy-acetone, is oxidized through formic acid to carbon dioxide, while a corresponding portion is reduced through acetaldehyde to ethyl alcohol, so in this case part of the butyric acid is oxidized and part reduced. Thus, a portion of the butyric acid may be considered to be reduced to butyl alcohol.

$$C_3H_7COOH + 2\,H_2 = C_3H_7CH_2OH + H_2O.$$

This reaction Dr. Reilly records his having observed, and what might be considered the weak point in the argument—for in the realms of pure organic chemistry the reduction of a fatty acid to its corresponding alcohol is considered a difficult matter—has been supported by actual experimental observations[4].

Another portion of the butyric acid is oxidized to beta-hydroxybutyric acid thus:—

$$CH_3CH_2CH_2COOH + O = CH_3CH(OH)CH_2COOH$$

The beta-hydroxybutyric acid may now be supposed to participate in two distinct reactions. One part of it splits, taking up the elements of water to form two molecules of acetic acid, thus:—

$$CH_3CH(OH)CH_2COOH + H_2O = 2\,CH_3COOH$$

Then logically, as the butyl alcohol is formed by the reduction of the butyric acid, the ethyl alcohol formed results from the reduction of a portion of the acetic acid.

The other portion of the beta-hydroxybutyric acid is further oxidized to aceto-acetic acid, and this in turn is decomposed to acetone and carbon dioxide.

While neither beta-hydroxybutyric acid nor aceto-acetic acid have been identified in the course of a fermentation, the following facts render their presence probable. When a fermented mash is distilled in caustic alkali solution and the distillate titrated for acetone by a modification of

[1] H. B. Speakman, Jour. Soc. Chem. Ind., 38 (155-161), June 30, 1919; S. F. Mathan, Jour. Soc. Chem. Ind., 38 (271-273), July, 1919; Amos Gill, Jour. Soc. Chem. Ind., 38 (273-283), July, 1919; A. C. Thaysen, Chem. Trade Jour., 65 (301), Sept. 20, 1919; I. Reilly and W. J. Hickenbottom, Chem. News, 119 (169-170) Oct. 3, 1919; A. Fernbach and E. H. Strange, United States Patents, 1044368, 1044446, 1044447.

[2] I. Reilly and W. J. Hickenbottom, Chemical News, 119 (169-170), Oct. 3, 1919.

[3] Euler, General Chemistry of the Enzymes, page 52.

the original Messinger method, the percentage of acetone calculated on carbohydrate is approximately 0.1 per cent. less than when the mash is acid when it is distilled. The distillation taking place immediately on the addition of the alkali, it is difficult to conceive of any diacetone-alcohol or other condensation product of acetone being formed, due to the catalytic activity of the alkali, more especially when as a general thing these condensation products have a tendency to decompose rather than to form at higher temperatures. Then the only other chemicals that could be volatile in acid solution and not in caustic alkali solution, and at the same time increase the iodine titration in the Messinger test, are with one exception volatile aldehydes. On analyzing fermented mashes according to the oxidation method suggested in Allen's Commercial Analysis, results greater than 0.04 per cent. aldehydes—calculated as acetaldehyde on the carbohydrate content—could never be obtained, and the average was 0.025 per cent. But, on the other hand, aceto-acetic acid in solution is unstable and decomposes below 100°C, forming acetone and carbon dioxide, and it is possible that the increased acetone content in the case of the acid solution is due to decomposition of aceto-acetic acid during distillation.

Starting with Glucose in this case the reaction may be considered as follows:

$$CH_2OHCHOHCHOHCHOHCHOH \text{ C.O.H.} = CH_3CH_2CH_2COOH + 2CO_2 + 2H_2.$$

One part of the normal butyric acid formed may then be considered as being reduced to the normal aldehyde and to normal butyl alcohol $CH_3CH_2CH_2CH_2OH$.

Oxidation of another portion of the butyric acid would form beta hydroxybutyric acid

$$CH_3CH_2CH_2COOH = CH_3CH(OH)CH_2COOH.$$

In order to form acetic acid, the beta hydroxybutyric acid may be considered as breaking in the middle and taking up the elements of water.

The production of acetone from beta hydroxybutyric acid comes through oxidation, when acetoacetic acid is first produced and then acetone and carbon dioxide. The path of the reaction may be shown as follows:

$$CH_3CHOHCH_2COOH = CH_3COCH_2COOH = CH_3COCH_3 + CO_2.$$

In the above, a small amount of ethyl alcohol may be produced by the reduction of the acetic acid formed from beta hydroxybutyric acid.

The above theory serves to explain why the production of acetone does not take place to any extent until after the maximum acidity is passed. What is taking place then is that the butyric acid is breaking up into acetone and butyl alcohol more rapidly than it is being formed from the carbohydrate. It also serves to explain how at the end of a poor fermentation, the acetone may be partially used up and the acidity thereby increased. It is well known that an enzyme that brings about a decomposition can in the presence of the products of the reaction synthesize the substrate from the products and in the above case that is what probably takes place. The theory also explains how in a poor fermentation only acid is produced, apparently only the primary reaction takes place; namely, the formation of butyric acid and the secondary reactions the formation of acetone and butyl alcohol do not occur. Likewise, when Dr. Thaysen[5] added acetic acid to the mash and increased the yield of acetone considerably, what he did was to disturb the decomposition equilibrium between the acetic and the beta-hydroxybutyric acids, and instead of the further decomposition of the hydroxy acid into acetic acid the reaction was reversed and the beta-hydroxybutyric acid so formed changed over to aceto-acetic acid and so decomposed into acetone, giving off carbon dioxide.

It is quite evident that the experimental work necessary to absolutely prove or disprove the above theory has just been started. At the time of the cessation of hostilities work was under contemplation to attempt to prove the presence of beta-hydroxybutyric acid in the fermented mash, but due to the shutting down of the plants this was never done. Theoretical calculations on the total amount of products of the fermentation, of course taking into account the proportions in which the various products are formed, check very well with the results obtained on analysis. Moreover, the above biochemical reactions are well known; for example, it is generally accepted that the "acetone bodies" of physiology, beta-hydroxybutyric acid, aceto-acetic acid and acetone, result from the oxidation of butyric acid obtained from the hydrolysis of fats, likewise the splitting of beta-hydroxybutyric acid to form two molecules of acetic acid is known. So it may be that the Weizmann bacillus merely contains certain enzymes that are supposed to be confined to certain pathological conditions of the human system, and this rather peculiar fermentation can be so explained without wandering farther afield, and it is in this spirit that the above theory of the fermentation is humbly submitted for consideration.

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Wilmington, Del.

[4] Reilly and Hickenbottom, Chemical News, 119 (169-170), October 3, 1919.

[5] C. Thaysen, Chem. Trade Jour., 65 (301), Sept. 20, 1919.

PULP AND PAPER INDUSTRY IN 1918.

The Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa, has prepared a report covering the pulp and paper industry in Canada for the year 1918. The statistics are presented for each class by number of mills, as follows: Pulp mills, 37, paper mills 31, pulp and paper mills 26, or a total of 94 mills. The total capital invested in the industry was $241,344,704.

Materials Used.

The quantity and value of materials used in the manufacture of paper were as follows:

	Tons.	Value.
Ground wood pulp	679,395	$14,215,895
Sulphite fibre	242,685	13,665,361
Sulphate fibre	35,587	2,260,443
Soda fibre	4,775	397,621
Other chemical fibre	2,419	219,654
Rags	20,138	1,412,367
Old or waste paper	47,350	1,320,338
All other paper stock	8,764	634,149
All other materials		3,423,508
Total cost of paper materials		$37,549,336

Production.

The total value of paper manufactured in 1918 was $76,700,913, of which $46,230,814 was in newsprint. The total value of wood pulp manufactured for sale or for export was $42, 608,521.

Fuel Consumption.

The total value of fuel used in the industry in 1918 obtained within Canada was $2,501,394. Of this amount $7,410 was for lignite, representing 788 tons; 143,399 tons of bituminous coal, slack, lump and run of mine, was used from Canadian mines, valued at $2,097,122. The total value of fuel from foreign mines, chiefly U.S.A., was $7,689,690, of which the largest amount was for bituminous.

International Council of Research

Statutes of the International Union of Chemistry Pure and Applied*

PRESENTED by the delegation of the Inter-Allied Conference of Associations of Chemistry Pure and Applied, London, July 14-18, 1919, and approved by the International Council of Research at Brussels, July 28th, 1919.

Art. 1.—An International Union of Chemistry Pure and Applied is instituted; its aim is:

To draw closer together the bonds of friendship and esteem which have gained strength between the different Allied Nations during the war. To organize a permanent co-operation between the associations of Chemistry of adherent countries. To co-ordinate their scientific and technical means of action. To contribute to the advancement of Chemistry in all its branches. Its duration is unlimited. Its provisory seat is at Paris.

Art. 2.—The admission of a country to the Union is subject to the conditions set forth by the Statutes of the International Council of Research. A country can belong to the Union through its National Federation, its National Council, or in default of these by the National Association representing Chemistry.

Art. 3.—The action of the Union is as defined by Article 1 is exerted by a Council assisted by an administrative secretaryship and by a special office, the institution of which will be made to be the object of an International Convention of adherent countries.

Art. 4.—The annual assessment is set down, for each country, at a rate in proportion to the number of its inhabitants, as follows:

Category.	Population in Millions.	Anuual Assessment (Minimum).
A	Less than 5	500 francs
B	From 5 to 10	1,000 francs
C	From 10 to 15	1,500 francs
D	From 15 to 20	2,500 francs
E	From 20 to 30	3,500 francs
F	More than 30	4,500 francs

The inhabitants of the colonies and proctectorate of a country who have no autonomy are included in the population of this country if desired, and on the advice of its Government. Every member of the Union is only subject to the expenses relative to the general administration. Any other expense can only be incurred by him after his approbation.

Art. 5.—Any member can resign from the Union on the condition that he has fulfilled his obligations for the current year. Cancellation can be pronounced for non-payment of the minimum annual assessment, or for serious reasons by the Council by the majority of three-quarters of the members represented, such member having previously been called upon for some explantion.

Art. 6.—The Union is managed by a Council composed of delegates from each of the adherent countries, whose number is fixed according to their category as follows:

Categories	Number of Delegates.
Category A	1 delegate
B	2 delegates
C	3 "
D	4 "
E	5 "
F	6 "

The delegates are nominated for three years by the National Federation, the National Council, or lacking these, by the National Association representing Chemistry in their respective countries, and may be re-elected. There is a new election for one-third of the Council each year.

Art. 7.—The Executive power of the Council is entrusted to a committee composed of a President, four Vice-Presidents and General Secretary. The Council elects its committee from its own members every three years. The members of the committee, excepting the General Secretary, can not be re-elected immediately to the same office. The President will be chosen from amongst the retiring Vice-Presidents.

Art. 8.—The Council meets at least once a year on the eve of the general annual meeting in thecity where it is to be held, and also, each time it is convoked by its President, or again, on the demand of one-quarter of its members. It is incumbent upon the Council to indicate the place and dates of meeting to arrange the budget and to decide upon the expenditures. As to scientific questions, resolutions are taken according to the majority of the delegates present. Concerning questions of an administrative and financial nature, each nation has the benefit of the number of votes equal to that of its delegates. It is not necessary that all these be present. A proxy can be designated by the delegates of the nation to represent them and share in the vote in their name. A vote by correspondence is permissible. In questions of current interest relative to the Council, if there is an equal number of votes pro and con, the President has the deciding vote.

Art. 9.—An official report of the sittings will be recorded. Minutes of the official reports will be made in duplicate and signed by the President and Secretary of each sitting. The Administrative Secretary will look after the archives and will be entrusted with the execution of the decisions taken by the Council and the committee, particularly with regard to the sending out of the daily order.

Art. 10.—The committee has as its mission:

1. To see that the Statutes are observed.
2. To draw up the agenda of the meeting.
3. To register and execute the programme of action as set forth by the Council.
4. To carry out the necessary acts of administration and to account for them in writing before the members of the Council, during the time that elapses between meetings of the Council.
5. To submit to the Council the proposed annual budget.
6. To represent the Union or to designate its representatives.

Art. 11.—A consultative committee formed out of as many sections as is necessary to insure the complete representation of Chemistry, pure and applied, conformable to the rules of the Union, will be instituted outside of the Council.

Art. 12.—The General Assembly includes members of the Council and delegates from various National Federations, National Councils, or National Associations representing Chemistry. A General Assembly meets at least once a year, preferably in the city where the International Congress of Chemistry, pure and applied, is held, and about the same time also meets whenever it is convoked by the Council, or upon the demand of at least

*Conclusion of article on International Union of Chemistry, Pure and Applied, published in February, 1920, issue Canadian Chemical Journal.

one-half of the members of the Union; listens to the reports, on the management of the Council, on the financial situation, and on the general condition of the Union. It approves the accounts presented by an outside accountant nominated by the General Assembly the preceding year. The General Assembly also votes the budget of the next meeting and deliberates on the questions taken up by the daily orders. The annual report and the accounts are sent each year, to all the members at least three months before the annual meeting of the General Assembly. The daily order of the Assembly is regulated by the Council, and will include the compulsory presentation of all questions that will have been submitted by one of the members of tht Union at least three months before the annual meeting of the General Assembly. Its committee is that of the Council. Votes on administrative and financial questions are expressed by countries, each of them having a right to the number of votes indicated by the categories included in Article 6. The delegates of a country can nominate one or more proxies to represent them and share in the vote in their name.

Art. 13.—The expenditures are passed for payment by the President and settled by the Administrative Secretary. The Union is represented in all acts of civil life and in law by the President, who can delegate his powers to a member of the Council, or to an administrative secretary.

Art. 14.—The deliberations of the Council pertaining to acquisitions, exchanges, alienation of immovables necessary to the aim sought by the Union, taking up of mortgages on the said loans, must be submitted to the approbation of a General Assembly.

Art. 15.—Any modification of the Statutes can only be submitted to the General Assembly on the suggestion of the Council of the Union, or on the demand of one of the National Federations, National Councils, or National Associations representing Chemistry. The suggestions of modifications will appear on the daily order of the General Assembly, provided they have been received in writing by the Committee of the Council, at least three months in advance. Votes are expressed by countries conformably to Article 8. Vote by correspondence is allowed. The Statutes can only be modified by a majority of two-thirds of the votes expressed.

Art. 16.—The General Assembly, called upon to pronounce on the dissolution of the Union, is specially convoked to that effect at least three months in advance. It should include at least three-quarters of the delegates of the members of the Union, or of their proxies. If this proportion is not attained, the General Assembly is again convoked after a minimum delay of six months, and this time can deliberate validly, whatever may be the number of the members present. Vote by correspondence is allowed. In any case, dissolution can only be voted by a majority of two-thirds of the votes expressed.

Art. 17.—In case of dissolution, the General Assembly designates one or more Commissaries entrusted with the liquidation of the property of the Union. The General Assembly donates the proceeds to one or more International institutions.

Art. 18.—The present French text will serve exclusively for the interpretation to be given to the articles of the Statutes.

The Canadian Carbonate Company will erect a plant here at the corner of 11th Avenue and Yew Street, Vancouver, at a cost of $100,000.

ALBERTA COAL PRODUCTION.

While complete returns for the coal production for 1919 in Alberta are not yet available, the production from January 1st to November 30th, 1919, was 4,241,580 short tons, divided as follows: Domestic, 2,122,759; Bituminous, 2,043,962; Anthracite, 74,859. December production is estimated at 800,000 tons, so that the total output for 1919 will be approximately 5,000,000 tons. The output for 1918 was 6,148,620 tons, the decrease of about 1,000,000 tons for 1919 being accounted for by the miners' strike, which lasted a little over three months. During the last three months of the year, however, the production was the largest on record, the greatest increase taking place in the domestic coal areas, where, during November, 454,217 tons were produced. The production of briquettes to November 30th was 63,033 tons, the estimate for the year being 70,000 tons, a reduction of 30,000 tons as compared with 1918. During the year 46 new mines were opened and 28 abandoned, there being now 291 in operation. At the end of November there were 11,565 men employed in the mines.

On December 23, 1919, the Coal-mining Industry Commission, appointed by the Alberta Government to investigate the Alberta coal industry, made their report, and some of their findings were:—

Extension of Markets—Many mines only operate one-half of the year or less. If more continuous operation is obtained the result will be a reduction in the price of the coal to the consumer and steadier employment to the workman.

Working Agreements—Provisions for making working agreements, the settling of disputes and such matters that employer and employee deal with, are not satisfactory.

Loss of Market—A considerable loss of market has been sustained owing to cessations of work, shortage of railway cars, misrepresentation as to size and quality of coal.

Sub-Leasing—Sub-leasing of coal leases issued by the Federated Government has the effect of unnecessarily increasing the cost of coal to the consumer.

Freight Rates—Existing freight rates militate against the marketing of Alberta coal in Manitoba and the United States.

Mine Equipment and Power—Mine equipment and power, under the present system, are too expensive.

Conservation of Coal—Large quantities of coal have been and are, lost through improper mining methods, as well as through cessations of work.

The Commission made twelve recommendations to the Government with a view to placing the Alberta coal industry on a sound basis, number two being that a permanent commission be appointed and given power by legisature to make working agreements and provide for the settlement of disputes. Number seven is also important—that subleasing of coal lands, leased by the Federal Government, be prohibited.

The Roessler & Hasslacher Chemical Co. are bringing suit against the alien property custodian to enjoin him from taking control of the stock of their company and subsidiaries held in the name of Franz Roessler. It is maintained that Roessler is an American citizen. The alien property custodian maintains that Roessler did not hold the stock in good faith, but was merely an agent for the Deutsche Gold undt Silber Scheide Anstadt, a large German industrial corporation.

Final Report of Nitrogen Products Committee

Final Report on Establishment of Nitrogen Fixation Plants in the British Empire.

The Committee was appointed in June, 1916, shortly after the inauguration of the submarine campaign to consider the question of establishing in England and in other parts of the Empire some of the newer processes for fixing atmospheric nitrogen in order to provide supplies of the nitrogen compounds essential for munitions and agriculture. The Committee was also required to carry out experimental investigations of such processes as appeared to be of utility. The Committee was composed of members nominated by Governnment Departments and by the principal scientific societies and of other leading scientific and industrial specialists.

Interim Report.

In February, 1917, the Committee submitted an interim report containing proposals for increasing the home production of nitrogen compounds for military and agricultural purposes. Among other matters, the Committee recommended:—

(a) The establishment on a large scale of one of the well-known nitrogen fixation processes, namely, the calcium cyanamide process.

(b) The establishment on a substantial scale of the ammonia oxidation process for obtaining nitric acid, the practicability of which had been demonstrated by the research work.

(c) The erecetion of a full-sized unit for testing the synthetic ammonia (Haber) process, which had been shown by the research work to hold out very great promise.

For various reasons it was not considered possible to proceed with the erection of a factory for the calcium cyanamide process as recommended. On the other hand, the engineers of the Explosives Department considered that the stage reached in the research work on the synthetic ammonia process warranted the erection of a factory for the manufacture of synthetic ammonia and ammonium nitrate.

As the outcome of an alternative proposal put forward by that Department in October, 1917, a commencement was made with the factory at Billingham for the fixation of nitrogen by the Haber process.

Final Report.

The Final Report is divided into a number of sections, in which the various aspects of the nitrogen problem are reviewed in detail.

Section 13 (pp. 120-133) contains a summary of the Committee's conclusions and also general observations upon the matters dealt with in the preceding sections.

Review of Pre-war Position.

In a preliminary statement the Committee emphasizes the fundamental importance of nitrogenous fertilizers and the essential need of various nitrogen produces for the manufacture of munitions and for important industries. A general indication is given of the relation between the older and newer methods or processes for obtaining nitrogen products.

With regard to the nitrogen industries before the war, it is shown that the demand doubled in the ten years, 1903-1913 (p. 19). Practically the whole of the world's demand was met by the Chile nitrate and by-products ammonia industries. The output of synthetic nitrogen products was relatively insignificant in spite of the notable developments of nitrogen fixation during the pre-war period (p. 19).

The report then dealt with the pre-war position of the United Kingdom, which was a very large producer of by-product ammonia, but a relatively small consumer of all forms of combined nitrogen. The bulk of the home production of by-product ammonia was exported in the form of ammonium sulphate (see charts reproduced herewith), but the country was entirely dependent upon imports for the nitrates required in agriculture and essential industries, such as the explosives industry.

Power Production for Nitrogen Fixation.

After indicating the power requirements of the various nitrogen fixation processes, and pointing out the importance of the cost of power as a factor in some of the processes, the Committee make a detailed investigation of the question of obtaining large supplies of cheap power for nitrogen fixation in the United Kingdom.

The production of power from coal is first dealt with, and an estimate is given of the cost of its generation in bulk by modern steam turbo-electric plant.

Consideration is then given to the important question, whether it is possible to cheapen the cost of electric power by submitting the coal to distillation and gasification processes, such as low temperature carbonization, as a preliminary to power production in order to conserve ammonia and other by-products. This aspect of power production is dealt with exhaustively in Appendix IV., p. 169-217. A review is also given of the Committee's enquiry into the prospects of obtaining cheap water power in the United Kingdom, and of utilizing peat for power production with ammonia recovery.

The Committee's conclusions (p. 43-45) point to water-power development as the cheapest source of power on a sufficiently large scale. It is also shown that in the present state of knowledge the application of carbonization and other processes to power production in bulk offers no immediate prospect of reducing the cost of electrical energy from coal below the figures attainable by direct coal firing. High prices of coal and high rates of wages are a handicap to all by-product power schemes (p. 128), and the Report clearly indicates limiting prices of coal beyond which recovery schemes are unable to compete financially with direct firing.

Costs of Established Processes.

The Committee has critically examined the costs of the established synthetic and non-synthetic processes and has prepared a reasoned estimate of the capital expenditure and working costs involved in operating them in the United Kingdom. The costs are summarized in Tables 35 and 36 (pp. 55 and 56).

The Committee's conclusions under this head (p. 59) indicate that synthetic fertilizers, such as ammonium sulphate and cyanamide, and also synthetic nitric acid can be produced at a cost, at the factory, which shows to very substantial advantage as compared with the pre-war market price of Chile nitrate and by-product ammonium sulphate.

Researches Undertaken.

A summary is given (p. 64-70) of the research work carried out under the direction of the Committee. Important results have been achieved in connection with the synthesis of ammonia, the manufacture and purification of hydrogen, the oxidation of ammonia to nitric acid, and the production of synthetic nitrates. The results of the experimental and trial work formed the basis of the scheme prepared by the Explosives Department for the national nitrate factory at Billingham.

Effect of the War on Nitrogen Industries and on Future Policy.

On account of the war demand the bulk of the world's supplies of nitrogen products have been diverted from agriculture to the manufacture of explosives. Statistics are given showing the expansion during the last four years of the Chile nitrate, by-product ammonia, and nitrogen fixation industries, and a review of the war positions in Germany and in the United Kingdom follows.

In Germany, which was the world's largest consumer of Chile nitrate before the war, the blockade and the enormous war demands have resulted not only in a large expansion of her by-product ammonia industry, but in a very remarkable development of nitrogen fixation. The estimated output of nitrogen products in 1917 was about three times her production in 1913.

In the United Kingdom, on the contrary, the home production of by-product ammonia remained practically stationary, and the country has depended entirely upon imports of Chile nitrate for the manufacture of munitions (pp. 77-8).

Summary of Conclusions.

The Committee contrasts the position of a country relying upon imported nitrates with that of one depending upon fixation processes principally as regards costs and shipping requirements (pp. 78-80). It concludes that considerations of national safety of finance and of utility would alike force a country to resort in future to the policy of adopting synthetic methods as an insurance against emergencies instead of placing reliance upon the importation of Chile nitrate.

Post-war Aspects of the Nitrogen Problem.

Consideration is given to the economic conditions confronting the world's nitrogen industries and to international competition.

The Committee concludes that in spite of the great expansion of the nitrogen fixation industry during the war, over-production is hardly likely to constitute a serious factor in the post-war situation (p. 120). Moreover, the demand for nitrogenous fertilizers is already considerably in excess of the pre-war consumption, and there will probably be ample scope in the post-war markets for both synthetic and non-synthetic products. The synthetic processes are also likely to supersede Chile nitrate as the source of nitric acid, but their position as regards the manufacture of artificial nitrates at a competitive price is more doubtful.

Requirements and Resources of the United Kingdom.

The Committee in a reasoned estimate shows that the present demands for nitrogen products for agriculture and industry in the United Kingdom, are already more than double the pre-war demand, and that the needs in the near future will be still greater.

The Committee considers that the maintenance of a large export trade in nitrogenous fertilizers should be an essential feature of post-war policy, since only in this manner could an economic use be found during peace time for an adequate reserve of plant for a future war emergency.

With regard to the possibility of rendering the United Kingdom self-supporting in nitrogen plants, the Committee reviews the prospects of the coal distillation industries, of low temperature carbonization, and of the recovery of ammonia from shale, peat and sewage (p. 96-106 and Appendix III., p. 149-166).

It is concluded, however, that while much could be done by the extension and development of ammonia recovery processes, a policy directed towards ultimate independence of imported nitrogen products would essentially involve the establishment in this country of nitrogen fixation on a large scale (p. 105).

Even if complete independence in peace time is not attempted, the Committee is emphatically of the opinion that in the light of the lessons learned during the war the national interests demand the establishment forthwith of nitrogen fixation and allied processes upon a considerable manufacturing scale.

Nitrogen Fixation in the British Empire.

The Committee deals with the nitrogen problem in Australia, Canada, Egypt, India, New Zealand, and South Africa, and comes to the conclusion that it would be practicable to make the British Empire during war and peace independent of external supplies of nitrogen products.

The Committee emphasizes the fundamental change in the military situation that has been brought about by the commercial development of nitrogen fixation processes, and points out that this country cannot afford the risk of dependence upon Chile in the future. It is urged that Imperial preparedness for defence is one of the vital problems to be faced, and should not be made subservient to commercial domestic requirements. The Committee advocates that an Imperial Authority should make a careful study of the defensive requirements of the Empire so as to decide which locations are most suitable for the establishment of the installation required to provide the necessary supplies (p. 119).

The principal conclusions arrived at by the Committee are summarized on pp. 120-133.

Recommendations.

The Committee's recommendations are given on p.133-137, and are summarized below:—

(I.) Provision for National Safety.

The following measures are recommended as a minimum provision for safeguarding the future and for meeting a portion of the growing home demand for various nitrogen products.

(a) The establishment without delay of the calcium cyanamide process on a scale sufficient to give an output of about 60,000 tons cyanamide per annum. This should be done either by private enterprise (supported if necessary by the Government), or as a public work, and the necessary electrical energy should be obtained either from water power in Scotland or from one of the proposed large steam power stations.

(b) The establishment forthwith of the synthetic ammonia process on a commercial unit scale and its expansion as rapidly as possible to a minimum manufacturing scale of 10,000 tons of ammonia per annum. The Committee recommends that the Bil-

lingham factory should be utilized for the purpose if such a course is practicable.

(c) The establishment of the ammonia oxidation process on a scale sufficient to produce about 10,000 tons of strong nitric acid per annum or its equivalent in nitrates.

(II.) By-Product Ammonia Industries.

Various proposals are made for conserving and increasing the output of by-product ammonia from gasworks, coke ovens, etc.; for securing the better utilization of the national resources in coal, and for reducing the consumption of raw coal as fuel. It is recommended that the local Government be given wider powers in this connection.

(III.) Trial, Operations and Research.

The trial on a works scale of various promising processes for the fixation or recovery of nitrogen is advocated, and the Committee also recommends that the researches on the nitrogen problem initiated during the war should be continued under the auspices of the Government for the general benefit of the country. Further, that the results of the researches carried out up to the present date should be edited and published at the earliest possible moment.

(IV.) Imperial Supplies.

The Committee recommend that a co-ordinated policy should be framed for safeguarding the future nitrogen requirements of the Empire, and suggest that Advisory Bodies should be set up in the various parts of the Empire to furnish the Imperial Authority with the requisite data.

(V.) Other Recommendations.

Among additional recommendations, the Committee advocates the offcial collection and publication of comprehensive statistics for the nitrogen industries of the United Kingdom, and for the home consumption of coal by various classes of users and industries. The Committee suggest that the question of statistics is also worthy of the attention of the Overseas Governments.

Nitrogen Fixation as a Key Industry.

Nitrogen fixation will constitute a new "Key" industry, and the Committee is of the opinion that its initiation and development will require the active support of the Government.—*The Chemical Age, London, Eng.*

THE ENGINEER AND ECONOMICS.

The importance of the necessity for a thorough knowledge of economics on the part of both manufacturer and engineer was emphasized at the opening meeting for the season of the Toronto Section of the American Institute of Electrical Engineers. Mr. Frank R. Ewart, representative of the Institute at the Ottawa National Industrial Conference stated that the appointment of engineering delegates representing the various societies to the Conference was a recognition of the engineer's status as one, who coming into intimate contact with both the manufacturer and laborer, was in a position to give impartial judgment on industrial matters. Mr. Willis MacLaughlan also spoke on the industrial problem and declared that both engineer and manufacturer should be as familiar with economics as were the labor leaders. Mr. Adolf Eberli, hydraulic engineer of the Ontario Hydro gave the expense involved in rehandling the crude rock at Hull. These expensive items will far more than off-set the additional cost of the hauling of coal to the present location. Power for the operations will be obtained from the Company's own installation on the Rouge River, only a few miles away. This plant will soon be built.

Chemical Society News

Montreal Section Society of Chemical Industry.

On February 20th, at the regular monthly meeting of the Montreal Branch, held at the Engineering Institute, Harold J. Roast and Charles F. Pascoe gave an illustrated lecture on the constitution of metals and alloys.

Mr. Roast, in introducing the subject, referred to the fact that that which was a matter of every-day practice to those engaged in any particular line of work might still be of interest to others whose lines of activity were in another sphere, and that it was from this viewpoint that the address was delivered.

He then stated that a lump of metal was to many just a lump of metal and nothing more, whereas the most delicate structures lay hidden beneath the surface of the metal, requiring only the removal of the outer skin to expose them to the eye of the observer. Pig iron was instanced in this connection and slides showing the delicate and complicated structure of this metal were thrown upon the screen. The speaker described an experiment to show how it was that one became aware of the inner life and activities of metals. The experiment consists in placing a pyrometer in the molten metal and allowing the same to cool when the action of the cooling matals was found to be entirely different to that of an ordinary cooling body.

Reference was then made to the crystalline structure of substances such as copper sulphate and lead chloride, this being given as a reason why no surprsie should be felt at the fact that all metals were crystalline. At this point, a slide was screened to show how the crystalline form of metals was built up, and others showing the crystalline structure of pure iron, pure lead and rolled sheet lead. Brief reference was then made to the methods used in preparing samples of metal for examination microscopically, and also to the fact that all the samples represented by the slides were prepared from samples of metal, melted, polished and photographed by the writers. In general, Mr. Pascoe had taken care of the ferrous division and Mr. Roast of the non-ferrous.

A series of slides was next shown descriptive of the construction and order of solidification of the constituents of the various components of cast iron, namely, graphite, ferrite, phosphide, which solidify in the order named.

The next group of slides indicated the reason why malleable iron and cast iron differed so largely in their physical characteristics, while yet the free carbon or graphite content might be identical. In the case of the cast iron, the graphite was shown to be present in the form of snake-like areas breaking up the iron or ferrite base, with the result that the metal was brittle. In the case of malleable iron, the same amount of free carbon or temper carbon existed in the form of nodules, leaving greater continuity in the ferrite, thus making the metal much less brittle or more malleable.

A very interesting progressive series of slides then followed, showing the same piece of steel casting having a slightly different structure which had been brought about by stirring up activity within the metal by suitable heat treatment. A slide was screened in this connection of a magnification of 1,000 diameters.

Some amusement was aroused by the next slide, as all that was visible on a dark background was a pin-point

of light. The explanation, however, proved interesting. The speaker stated that the proportion of this point of light on the screen to the whole area of the pictures previously shown, represented the magnification that had been employed. Another statement was also interesting to the effect that the cross-section of an ordinary pin was almost exactly the actual area of the various metals from which the pictures on the slides had been obtained. In the case of 1,000 magnifications a pin's point was required to completely fill the microscopic field.

A remarkably interesting series then ensued dealing with the silver copper alloys, the phosphor copper compound commonly used in foundries, the ordinary every-day solder and particularly fine examples of copper and copper oxide, as also of copper antimony alloy.

The Pathological side of Metallography was then taken up. A slide was shown explaining the reason why copper or gold, which was so hard to saw in a state of purity, fell apart like a piece of ordinary hard wood if alloyed with 1/100 to 1/10 of bismuth. At this point, attention was drawn by the speaker to three examples of failure of Admiralty Bronze. The diseased spots of oxide, which acted in a manner similar to cancerous growth spreading under the influence of fatigue and corrosion, until the whole metal became rotten and portions fell away, were clearly seen. The analogy of a case of gangrene in the human body to this diseased metal was pointed out by the speaker. This analogy between diseased metals and diseased bodies was also shown in an example of an enlarged crystalline condition in brass, corresponding to an enlargement of the human heart or liver.

Slides explaining why one copper brass alloy could be forged into rivets at a red heat, whereas another alloy could not be so worked were demonstrated. A striking explanation was given of the effect of heat treatment of Muntz metal, the first picture containing a complicated structure of remarkably delicate detail, while the next picture was almost structureless. The audience was informed that these two castings were derived from the same part of molten metal, one being allowed to cool slowly and the other being quenched at a suitable temperature. The former metal would be ductile, but not so strong as the latter, while the quenched metal would be stronger and harder, but much less ductile.

The speaker referred to what he believed to be the growing development of the heat treatment of brasses and bronzes just in a similar way to that employed in connection with steel. Slides were shown illustrating a matter of metallographic interest, namely, that a tin copper constituent was undoubtedly stable at ordinary temperature in an alloy containing less than 12% of tin.

The last slide showed the complex structure of an ordinary babbitt, the speaker explaining that the white crystals shown on the screen represented hard constituents which carried the load, while the softer background made a cushion which carried the harder load bearing constituents.

Several Microscopes were set up with samples of metal focused under them and many availed themselves of this opportunity of seeing the beauties of color and structure when viewed direct.

Considerable discussion followed the reading of the paper, Dr. Porter, of McGill, referring particularly to the amount of patience required to produce such fine slides as had been shown. Similar remarks were made by other speakers. During the discussion, slides made from samples sent over by Dr. Stead were shown in conection with blast furnace bears, or masses of metal taken from the foundations of blast furnaces where there would be unique opportunities for long and gradual temperature changes to take place.

Toronto Branch, Society of Chemical Industry.

In point of the number of matters discussed and of enthusiasm the February meeting of the Toronto Branch of the Society of Chemical Industry, held at the Engineers' Club, Friday evening, February 20th, was one of the most successful sessions held by the Branch.

Owing to a death in his family, Mr. H. W. Matheson, Vice-president of the Canadian Electro-products Co., Shawinigan Falls, Que., who was to have addressed the meeting, was unable to attend. The executive had no time in which to arrange for another speaker or to notify the members, and though many were disappointed by not hearing Mr. Matheson, yet the evening turned out to be a very profitable one, and the members present were advised by the chairman, Professor E. G. R. Ardagh, that they would in all probability hear Mr. Matheson at the March meeting.

Following the dinner, the meeting was thrown open for discussion, and it soon became evident that there were several points which the members wished discussed and these were enumerated by Professor Ardagh, as oleomargarine, an exhibit of chemical industries, the relation of undergraduates to the Branch, and publicity.

Mr. J. R. Donald opened the discussion on oleomargarine and urged strongly that the Branch, through the Society, present a memorial to the coming session of the Dominion Parliament, requesting that the present Order-in-Council, permitting the manufacture, sale, and importation of oleomargarine be continued as a permanent legislation. Mr. Donald emphasized two points in particular, first, the purity of the product, and secondly, the necessity of meeting the purses of the majority of people who could not afford butter at its present high price. Mr. Jas. Mason spoke somewhat in opposition, taking the ground that the Society should go slow in a matter that concerned a food product of the nation. The matter was then left to the executive committee to bring in a report at the next meeting of the Branch.

The advisability of having an exhibit of products, and apparatus, of Canadian chemical industries either at the coming convention of chemists at Toronto, in May, or at the Canadian National Exhibition, at Toronto, in September, was then taken up. Mr. L. E. Westman thought that such an exhibit was something that might well be seriously considered. The meeting was fortunate in having Mr. J. P. Murray, of the National Exhibition executive, present. Mr. Murray referred to the difficulty in securing space at the Exhibition, but favored the Society taking the matter up immediately. A committee was then formed to consider the exhibit proposal consisting of Messrs. J. P. Murray, Alfred Burton, and L. E. Westman.

Mr. M. L. Davies, vice-president of the Standard Chemical Co., Dr. Lash Miller, and Mr. Westman spoke on the matter of publicity. Mr. Davies considered much good could be done not only the Society, but chemistry in general, by having the meetings reported in the daily press. Even a short item would have a wide influence, and he referred to the action of the American Chemical Society in their news service committee. A committee consisting of Mr. Davies, Mr. Donald, Mr. Murray, and Mr.

Westman was then appointed, to bring in a report on ways and means of handling the publicity matter.

Perhaps the most interesting feature of the meeting was the consideration of the question of the relation of the undergraduates at Toronto University to the Toronto Branch. In response to the invitation of Professor Ardagh several students voiced their opinions on this important matter and gave many good suggestions for improving the relationship between the students and the Society. Mr. Musgrave, Science '21, suggested that the students could be made more interested in the Society if, at certain dates during the season, an informal smoker was held by the Society, to which the students were invited, and where they could have the opportunity of meeting manufacturers and technical men. The smoker was suggested as more nearly fitting the purses of the average student than the regular monthly dinner of the Society. Another suggestion of Mr. Musgrave was that at these meetings papers be given by students on some work they were doing or had undertaken. The matter of the Society helping students get employment upon graduation was also mentioned by Mr. Musgrave. Mr. McLean, another student, believed that the time for the Society to get hold of the student was in his first year, and then he would be permanently interested.

Professor Bain said that he heartily concurred in several of the students' suggestions and would personally bring the Society to the attention of his classes at once. Dr. Lash Miller especially commended the giving of papers by the students and remarked that he had recently heard two papers by students at the University Industrial Chemical Club that surpassed many papers, in point of technical excellence, that he had heard elsewhere. The matter was then left to the executive to deal with, and the members feel sure that the Toronto Branch will soon be actively connected with the student body at the University.

MONTREAL NOTES.

Speaking at the Convention of the Engineering Institute of Canada, held in this city recently, Professor R. F. Ruttan, of McGill University, emphasized the need for a thorough combination of theory and practice in the training of students of Chemical Engineering. According to Dr. Ruttan, existing methods of training Chemical Engineers were inefficient and the time was therefore ripe for the introduction of a new system. The opinion of the speaker was that the plan adopted by the Massachusetts Institute of Technology was the best one so far devised. Under this system, the student course was extended to five years, the last of which was spent at five research stations which had been established in connection with plants engaged in different branches of Chemical Engineering.

In the death of the late Professor Ebenezer MacKay, the Canadian Institute of Chemistry has lost one of its most active members. Professor MacKay was a member of the Council for 1919-20, and did much towards assisting in the building up of the Institute. His place on the Council will be a hard one to fill.

We are informed by the Employment Bureau of the Institute that out of a list of twelve chemists who had placed their names on file as wanting a position in the month of November, all had secured work of a chemical nature by the end of January. This seems to indicate very strongly that good chemists are very much in demand at the present time.

Dr. R. F. Ruttan was recently appointed as McGill University representative on the Dominion Biological Board, the main object of which is to study the habits of fish found in Canadian waters. Another object of the Board is an investigation of the food supply of the fish. Membership on the Board, which is under the control of the Marine Department, is entirely honorary.

Members of Canadian Institute of Chemistry.

Fellows and Associates of Canadian Institute of Chemistry enrolled up to February 21st, 1920.

FELLOWS.

*Ardagh, Professor E. G. R., B.A.Sc., University of Toronto.
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*Babington, F. W., F.I.C., 41 Lyon St., Ottawa, Ont.
*Bain, Professor J. Watson, 393 Brunswick Ave., Toronto, Ont.
*Bates, Dr. J. S., B.A., B.Sc. (Chem. E. Ph.D.), c|o Price Bros., Kenogami, Que.
*Blake, A. F., Ph.B., c|o Atlantic Sugar Refineries, St. John, N.B.
Brockbank, C. J., Carleton St., Thorold, Ont.
*Bardorf, C. F., St. Lawrence Sugar Refineries, Montreal, Que.
*Bell, J. B., Jr., B.SC., M.Sc., Canadian Explosives, Limited, Transportation Bldg., Montreal, Que.
Breithaupt, J. E., B.A.Sc., Breithaupt Leather Co., Kitchener, Ont.
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*Baril, Dr. G., B.A., M.D., Laval University, Montreal.
*Bigelow, Dr. H. E., B.A., A.B., A.M., Ph.D., Sackville, N.B.
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Blackstock, G., B.A., M.A., 79 Prince Arthur Ave., Toronto, Ont.
*Banks, A. J., Ogilvie Flour Mills, Montreal, Que.
Ball, J. A. B., c|o St. Lawrence Sugar Refineries, Montreal, Que.
Bletcher, H. E. J., Professor, Phm.B., University of Manitoba, Winnipeg.
Baker, H. A., M.S., C.W.S., Lakehurst Proving Ground, Lakehurst, N.J.
*Cook, S. J., B.A., A.I.C., Dept. Trade and Commerce, Ottawa, Ont.
Papineau-Couture, A., B.A., 317 Queen St. West, Ottawa.
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COMPANY NOTES.

The Canadian Ingersoll-Rand Company, 260 St. James Street, Montreal, have branched out into the manufacturing and selling of rubber mill machinery, and have concluded arrangements with the Wellman-Seaver-Morgan Company, Cleveland and Akron, Ohio, to manufacture their line of hydraulic turbines, calendars, crackers, washers, tire-rimming and applying presses, mixing mills, hydraulic press vulcanizers, grooved rolls, cores and moulds, special castings, and other rubber mill requirements. The company have bulletins and printed matter on these lines, which they will send to any reader of the Chemical Journal.

The West Furnace Carburetor Company of Canada, Ltd., has been incorporated under an Ontario charter, capital, $100,000, with head office at Toronto. T. B. Richardson, Toronto, solicitor.

The Premier Tire and Rubber Company has been incorporated under an Ontario charter, capital, $300,000, with head office at Hamilton, Ont. Incorporators, R. E. Wright, H. T. Pyke, tire salesman.

BOOK REVIEWS

INDUSTRIAL GASES.

By H. C. Greenwood, O.B.E., D.Sc., F.I.C. Balliere, Tindall & Cox, London, Eng.; Canadian agents, Westman Press, Ltd., Toronto. Figures, 23; pages, 371. Price, $3.15.

The branches of gas manufacture are still in course of vigorous development and the war has been responsible for intensive work in many countries. The author has perhaps quite rightly concentrated on general principles and has left the very detailed treatment of special processes to later efforts.

From the large industrial and academic field now interested in the production of gases in commercial quantities the book will find a welcome response. There are indeed few men capable of reviewing properly the whole of such a work, as the developments have been so recent that only those exceptionally well and broadly informed during the war period were in touch with the work being done.

In general, the work is divided into three parts, following an introductory chapter. The number of references to original literature and patents is a distinct advantage if it be desired to follow the text with a more exhaustive study.

Part 1.—Gases of the Atmosphere. (a) Air, Manufacture of liquid air, oxygen and nitrogen, with separation of rare gases; (b) Oxygen; (c) Nitrogen; (d) Rare Gases; (e) Ozone.

Part 2.—Hydrogen, Carbon Monoxide, Carbon Dioxide, Sulphur Dioxide, Nitrous Dioxide, Asphyxiating Gases.

A very complete description of stationary hydrogen plants and the production of hydrogen for military purposes is given. The portion of the book devoted to hydrogen seems to be exceptionally complete. In general, the procedure to be taken in describing a gas is as follows:—Properties, manufacture, applications and estimation.

Part 3.—Gaseous Fuels.—This great field has been treated in a manner similar to the other sections, and while the processes may be more generally known than those relating to other gases, the importance of the products considered allows for a constant record being kept of advances as they are made. There is no doubt but that the author, who was familiar with English practice, has discussed many points of value to those interested in such fuel problems in America.

The untimely death of the author so very recently cannot but be considered, when reading this book. Dr. Greenwood, through his connection with the Research Laboratory of the Ministry of Munitions, and from the fact that he had worked with Professor Haber at Karlsruhe on a study of catalysts for ammonia synthesis, was able and did a vast amount of scientific work in England during the war, the importance of which it is hardly possible to gauge. Following his death a few months ago at the early age of 32, we have left this unquestionably most important contribution to the commercial literature of a series of relatimely new industries.

Canadian Mining Institute.

Canadian Mining Institute. Twenty-second Annual General Meeting, Toronto, March 8, 9 and 10, 1920. R. R. Rose, Assistant Secretary, Montreal.

DEVELOPMENT OF CANADIAN CLAY PRODUCTS.

The eighteenth annual convention of the Canadian National Clay Products Association was held in Toronto during the week of January 19. Delegates were present from Galveston, Texas, and several other United States centres, and included Mr. Theodore Randall, President of the National Brick Manufacturers Association, Indianapolis. President Wm. Burgess, who presided, in his opening remarks referred to the need for better railroad rates. As it was the present high rates were preventing the shipment of clay products to border cities. During the year the Association undertook a test of clay from Labrador at the request of Dr. Wilfred Grenfell, M.D., D.D., who hoped to make brick from the clay for his mission hospitals. These tests are being continued under the direction of Mr. Joseph Keele, B.Sc., at the Government Laboratories, Ottawa.

In an address to the Association, Mr. Millard F. Gibson, of the National Fire-Proofing Company, urged the development of Canada's pottery possibilities so that Canada would not be dependent on Europe for its clay products, porcelains, and optical lenses. The vast bed of white clay which had been uncovered south of James Bay should, the speaker declared, be developed to its fullest extent, as should the feldspar and other natural deposits used in pottery manufacture.

The following officers were re-elected for 1920:—Past President, Thomas Kennedy, Swansea; President, William Burgess, Todmorden; 1st Vice-President, Ryland H. New, Hamilton; 2nd Vice-President, Millard F. Gibson, Toronto; 3rd Vice-President, T. H. Graham, Inglewood; Secretary-Treasurer, Gordon Keith, Toronto; Councillors, H. H. Hallatt, Tilbury; W. H. Freeborn, Brantford; N. T. Gagnon, Montreal; Andrew Dodds, Mimico; John S. McCannell, Milton; F. B. McFarran, Toronto; Chas. A. Millar, Toronto, and C. B. Lewis, Toronto.

COMPANY NOTES.

Isaac Winkler Brother & Co., of Cincinnati, have purchased the stock of the Jarecki Chemical Co., of Cincinnati, formerly held by enemy aliens resident in Germany, from the alien property custodian.

The North American Magnesite Producers, Ltd., has recently been incorporated with a Dominion charter, capital, $1,000,000. The head office is at Montreal. Lawrence MacFarlane, K.C., solicitor, Montreal.

Katzenback and Bullock Company, Inc., New York and Montreal, importers, exporters and manufacturers of chemicals and colors, have opened a new office in Philadelphia, Pa., at 119 South Fourth Street, with Mr. R. M. Smith in charge. Mr. Smith has been covering the territory of Pennsylyania, Delaware, Maryland and Southern New Jersey, and the object of opening this new office is to be able to better serve the trade in these states.

CANADIAN FISH INDUSTRY.

The Dominion Government has issued a report covering the fisheries of Canada for the year 1918. The total value of the fish caught in sea fisheries along the coasts and in inland waters during 1918 was $61,363,502. The number of factories in operation in the fish industry in 1918 was 939, divided as follows: Lobster canneries, 534; salmon canneries, 81; sardine canneries, 3; clam and other fish canneries, 14; whale oil factories, 4; fish oil factory, 1; fish curing establishments, 302.

INDUSTRIAL SECTION

Construction, Manufacturing and Market News

Industrial News Items

British Columbia.

Copper Mountain—Construction of the concentration mill of the Canada Copper Co. is proceeding. The mill has a capacity of 2,000 tons daily. The construction of the railway to the mine costing $1,000,000 and of the power line costing $200,000, is proceeding steadily. Operation of the entire plant is expected by the summer of 1921.

Marpole—The Barrett Co., Ltd., tar products and roofing, are constructing a $12,000 addition to their plant.

Prince Rupert—That the mining season of 1920 will be a record one in Northern British Columbia is the opinion of Major Geo. Hull, District Engineer of the Dominion Department of Public Works.

Vancouver—The Maitland Cold Storage and Ice Co. is erecting a $15,000 cold storage plant on the C.P.R. reserve, foot of Nelson Street.

The Britannia Wire Rope Company has awarded the contract for the construction of the first part of its wire rope and steel mill on Industrial plant.

Victoria—The C.N.R. have awared the contract for the erection of a large round house, turntable and machine shops, costing $30,000.

Manitoba.

Winnipeg—The Reliance Ink Company have increased their capital from $20,000 to $40,000, to fiance plant extensions. An addition to their factory has been constructed. The company are going to extend their manufacturing to include envelope gum, label paste for bottlers, and padding glue for the printing and bookbinding trades.

The Beaver Soap Company, W. G. Fraser, president, is installing $8,000 worth of new machinery.

A new company has been incorporated at $300,000, the Manitoba Clays and Building Supplies, for the manufacture of clay products, building supplies, road and bridge construction supplies. The erection of two plants is contemplated. President, J. L. Thomas, C.E.; vice-president, Joseph Dixon; secretary-treasurer, H. Lewis White.

The Red River Paper Mills will shortly commence operations in their new plant, with 350 feet frontage, on the Red River. Frederick T. Gilroy is the manager of the company, and will manufacture new paper from waste paper.

Ontario.

Brockville—The Jireh Food Co., formerly located at Maitland, Ont., have removed here, manufacturing their Jireh breakfast food and a diabetic flour. The principals of the company are Merrill W. McDowell and N. MacDonnell.

Brantford—A new warehouse, 400 x 90 feet, steel and brick, is now under construction by the Brantford Cordage Co., makers of binder twine and cordage. An additional two and a half acres have been purchased by the company to allow for further expansion. The capacity of the plant at present is 10,000 tons of binder twine per annum taxing the capacity to the limit.

The Blue Bird Manufacturing Co. of Canada has been formed here to manufacture all the electrical household appliances of the Blue Bird Co. of St. Louis. Electrical iceless refrigerators will be one of the products.

The Dominion Steel Products Company will erect a foundry here, adjoining the main plant, estimated cost, $150,000, 100 x 160 feet, for the production of high-grade steel castings for machinery manufactured in their general plant.

Hamilton—The Hamilton Gear and Machine Co., Toronto, contemplate moving to new premises at 62-84 Van Horne Avenue, allowing for improved service.

Proctor and Gamble, soap manufacturers, are erecting a three-storey addition, 50 x 100 feet.

Dunnville—The Dominion Canners, Ltd., intend making alterations to their plant here.

Chatham—The Wilson Company, Chicago packers, who acquired the plant of the Chatham Packing Co., have made considerable improvements to the plant, and can now handle 750 hogs per day.

Merritton—The General Forgings and Stampings, Ltd., formerly the Canada Pole and Shaft Co., are erecting a complete new forging department. The company operate on automobile forgings and stampings.

Oshawa—The new plant for the Pedlar People, Ltd., roofing manufacturers, is now under way. The new plant is 440 x 365 feet, brick, steel and cement; two storeys.

St. Mary's—The St. Mary's Cement Co. is engaged on the making of a new super-cement, the invention of a Mr. Goddard of England. It was used during the war by the British Government for petrol tanks and is claimed to have a greater tensile strength than ordinary cement.

Strathroy—The Dominion Canners, Ltd., have completed the new factory and warehouse to replace the one destroyed by fire.

St. Catharines—McKinnon Industries, Ltd., are enlarging their forge plant by an extensive 70 x 50 feet, for the production of automobile drop forgings, gear forgings, and rolled gears.

Sault Ste. Marie—The Algoma Steel Corporation will proceed immediately with the construction of their new steel mill for making structural steel for the Canadian trade, of which at present 90 per cent. is imported from the United States. The new plant will cost about $6,500,000.

Toronto—The Canadian Fairbanks-Morse Co. are making extensions to their plant to accommodate their large engine business.

Benjamin Moore & Co., manufacturers of muresco, paints, colors and varnishes, have erected a new warehouse, containing about 12,000 square feet floor space.

Lever Bros., Ltd., the well-known soap manufacturers,

have commenced the construction of two large new factory buildings, each three storeys, and 140 x 80 feet. These are erected to take care of the every-increasing demand for the company's products.

The Canada Linseed Oil Mills, Ltd., are erecting a new office and warehouse building, two storeys and basement, 30 x 40 feet.

Thorold—The Beaver Board Company have just completed their new finishing plant, 125 x 362 feet, brick, steel and concrete, with a capacity of 500,000 feet per day, employing approximately 100 men. They have also extended their dwelling houses for workmen, having just completed seven more double houses and three single houses.

Welland—The plant of M. Beatty & Sons, Ltd., which was bought by the Mead-Morrison Co. of East Boston, Mass., will be now known as the Canadian Mead-Morrison Co., Ltd. The Beatty products will be continued as well as the Mead-Morrison line of conveyors, etc., for coal, ore, cement, etc.

Quebec.

Montreal—Samuel Osborne & Co. are erecting a new building, 120 x 80 feet, costing some $40,000, to be utilized for the warehousing of steel bars, wire rope, etc. A small portion of the new plant will be used as a demonstration plant for the heat treatment of steels.

The National Breweries are extending four of their nine breweries, three in Montreal and one in Quebec, doubling the capacity, at an estimated cost of $17,500,000.

St. Johns—The new plant erected by Kenworthy Bros. of Stoughton, Mass., has commenced operations, manufacturing a treated wood felt used as an insole in rubber and leather shoes.

Shawinigan Falls—The electric furnace plant of Fraser, Brace & Co., erected during the war, and the iron foundry of Normandine Bros. have been acquired by new interests and are operating now as the Shawinigan Foundries, Ltd. . G. G. Macartney, formerly of Fraser, Brace & Co., is president; W. G. Dauncey vice-president and metallurgist, and C. M. Hall secretary-treasurer. It is intended to continue the manufacture of pig iron in one furnace, pending developments which may lead to the production of ferro-alloys and spiral steels. The iron foundry will be extended to handle the demand for ordinary castings. Brass foundry work will also be carried on.

Three Rivers—Four new paper machines are being installed by the Wayagamack Pulp and Papers Co., with new buildings to accommodate them.

BRITISH MADE X-RAY APPARATUS.

UNITED Kingdom manufacturers of X-ray apparatus have nothing to learn from those of any other country. In no case has any country preceded the United Kingdom in the use of any important system of radiological dom in the use of any important system of radiological work. Deep-seated therapeutic treatment, long-distance radiography, combined X-ray and radium therapy and other similar methods hailed as innovations had all been practised unobtrusively in England before they were sent forth by Continental—and usually German—workers. The pressing needs of the British War Office during the war made large demands upon manufacturers in the United Kingdom; but they speedily brought their output up to the required point, and were able to satisfy the wants not only of the British Navy and Army, the British Red Cross and the ordinary Civil Hospitals, but also the demands of all the British Colonies and of Russia, Serbia and Roumania, and in some degree of Italy and Spain. British X ray apparatus has been used in every part of the globe, and under the most difficult circumstances, and it has proved uniformly reliable and durable.

The recent advances in the construction of X-ray tubes, and the corresponding improvements in apparatus for the production of the necessary high-tension current, have made it possible to examine the internal structure of steel plates and castings, as well as of less dense materials such as aluminium and wood. The radiography of thickness up to 2 ins. of ferrous metals has been successfully effected, and regular advances are being made in the knowledge and technique of the subject.

New Uses of the X-Ray.

As to uses, flaws and blow-holes in castings and welds show clearly. In an X-ray photograph a flaw 1 mm. diameter in a plate 2 cm. or 3 cm. thick shows very distinctly, and much smaller defects can be detected. Porous places show up the well-defined light patches. The quality of electric and acetylene welds can be determined. Where union is incomplete the edges of the original plates can be distinctly seen, while in a good weld the boundary between the plate and the added metal vanishes completely. The size and number of blow-holes in the molten portion are very plainly shown; small blisters in the plates themselves show up as very distinct light spots, thus indicating whether the plates have been damaged by the heat. Different qualities of metals are shown by different densities in the images, *e.g.*, a wrought rivet in a casting of the same metal shows plainly a darker image Carbon, manganese and tungsten steel all give images of different densities for equal thickness. Considerable use may be made of the rays in detecting lack of homogeneity in alloys, uneven distribution of a constituent showing plainly as a patchy structure in a radiograph.

In the examination of timber up to 18 in. thick X-rays are very useful. Internal knots, resin pockets, bad shakes, cracks and grub holes are easily seen. Great use has been made of the X-rays in the examination of inaccessible parts of wood structures, such as hollow spars for aeroplanes, or the inner layers of plywood, where the quality of the material and workmanship cannot be ascertained by the usual methods. The purity or otherwise of insulating materials for electrical use can be rapidly ascertained, small metallic specks in fibre or mica, for instance, being instantly detected.

X-Ray Tubes.

One of the most important factors in connection with X-ray work is the production of efficient tubes, and the progress made in this direction in the United Kingdom has been of a notable kind. Prior to the war the glass for X-ray tubes was imported from Germany; but at the present time an absolutely efficient material is manufactured in London, and X-ray tubes are produced in large numbers and of a high degree of excellence. United Kingdom manufacturers are now in a position to offer considerable quantities of tubes for export, and it is hoped that a large part of the business formerly done by Germany will be secured for United Kingdom factories. All the types of X-ray tubes in general use are being made, including large and small tubes with platinum or tungsten targets of medium and heavy weights, water-cooled tubes, radiator tubes, therapeutic models, valve tubes of various types and so on.

The names of British manufacturers of X-ray apparatus and tubes can be obtained from the British Trade Commissioners in Canada.

A Review of Ontario Nickel Production*

Production During 1918.

UNDER the stimulus of war, the production of nickel in Ontario reached the highest point yet recorded. There were turned out of the converters at Copper Cliff and Coniston 87,184 tons of matte, the nickel contents of which were 45,886 tons. Of the matte 5,334 tons were treated at the International Nickel Company of Canada's refinery at Port Colborne, which went into operation in July, 1918. As compared with 1917, the nickel output of Sudbury shows an increase of 2,410 tons. The value of the nickel in the matte form was $26,578,200, an increase over 1917 of $5,634,700. The quantity of ore smelted was 1,559,892 tons, and of ore raised from the mines 1,643,040. This production was from the following mines:

	Tons.	Tons.
International Nickel Company—		
Creighton	1,104,673	
Crean Hill	125,836	
		1,230,509
Mond Nickel Company—		
Garson	143,016	
Victoria No. 1	33,498	
Worthington	69,793	
Levack	97,585	
Bruce	39,021	
		382,913
Alexo Mining Company—		
Alexo		8,618
British America Nickel Corporation—		
Murray		21,000
Total		1,643,040

The ore raised from the Alexo Mine, an extra-Sudbury deposit, was shipped as usual to the Mond Nickel Company, and smelted at the latter's works, Coniston. None of the Murray Mine ore extracted by the British America Nickel Corporation was treated, this company's works not yet having been completed.

For the first three months of the year the mines and works at Copper Cliff and vicinity continued to be operated by the Canadian Copper Company, the pioneer of the nickel industry in Ontario, which was organized under the laws of the State of Ohio in 1886 to take over the holdings of Samuel J. Ritchie. For the remainder of the year the properties were worked by the International Nickel Company of Canada, Limited, to whom they were transferred, and in whose name also the refinery at Port Colborne is conducted, thus effecting a new amalgamation of all the Canadian interests. To the perseverance shown by the Canadian Copper Company, and the high degree of ability and technical skill which has characterized its career, it may be justly said the nickel business of this Province owes not only its origin, but to a large extent its successful development.

The British America Nickel Corporation, in which the British Government holds a controlling interest, was steadily at work during 1918 developing the Murray Mine, and in erecting a smelter there and a refinery at Deschenes, Quebec. This refinery will operate the electrolytic process of recovering the nickel and copper from the matte, as developed by V. N. Hybinette in Norway.

The number of men employed in the mining, smelting and refining of nickel in Ontario in 1918 was 3,735, to whom were paid as wages $7,233,289. The quantity of coke used at the furnaces was 197,010 tons, worth $2,772,672, and of wood, chiefly for heap-roasting purposes, 35,296 cords, valued at $161,262.

From the silver ores of the Cobalt area there were recovered in the refineries at Thorold, Deloro and Welland the following nickel products, the figures being those of actual shipments:

	Quantity, lbs.	Value.
Nickel Oxide	406	$ 106
Nickel Sulphate	329,669	28,772
Nickel Carbonate	75,594	19,393
Nickel Metal	270,029	108,622

Adding the metallic nickel equivalent of the above to the nickel contained in the Sudbury mattes, the total production of nickel in 1918 was 46,072 tons.

New Nickel Areas in Ontario.

The discovery of the nickel deposit known as the Alexo Mine, situated in the township of Dundonald, in the Porcupine area, showed that there were nickel ores in Ontario outside of the great nickel ranges of Sudbury. The typical method of ore occurrence in the latter is at or near the contact between the norite and granite or other acid rock, geologists not being in agreement as to the manner in which the ore was deposited. The Alexo ore body is also a contact one, but the parent formation is serpentine, and that with which the contact is made is andesite. The Alexo Mine has up to the end of 1918 produced about 49,132 tons of ore, which resembles the Sudbury ore in composition, being essentially a mixture of pyrrhotite and chalcopyrite, carrying nickel. Alexo ore, as shipped, is somewhat richer in nickel and poorer in copper than the average ores of Sudbury. Nickel ores have been found in other sections of Ontario, namely, in the township of McCart, in the township of Munro, and in the township of Strathy, Timagami Forest Reserve, and more recently it has been reported from near Lake Shebandowan, in the district of Thunder Bay. Steps are being taken by the Bureau of Mines to investigate the extent of these deposits, but, generally speaking, while it can be said that the ores do exist, no large and important bodies are as yet known to occur. C. W. Knight, Assistant Provincial Geologist, will be in the field during the season of 1919 in order to obtain data for a report on these extra-Sudbury deposits.

In the Sudbury area itself, a body of water, known as Windy Lake, lies in the townships of Cascaden and Dowling, where the northern band of norite bears to the southwest. As mapped by Coleman, the norite-granite contact passes through Windy Lake, and, with the view of locating a possible ore body on its bed, a magnetometric survey was made on the ice last winter. The work was done by A. H. A. Robinson, of the Department of Mines, Ottawa, and C. W. Knight. The services of the former, along with the magnetometer, were courteously loaned the Bureau for the purpose by the Mines Department. At the same time a traverse and survey of the lake were made by McAuslan and Anderson, Ontario Land Surveyors; also a series of soundings to ascertain the depth of the lake. The magnetometer, however, gave no readings from which the existence of ore could be inferred.

The Ontario nickel ores are sulphides, and are undoubtedly the most important bodies of this type known to-day. In other countries, especially those which have escaped the action of glacial forces, ore bodies of the lateritic type[1] occur, some of which carry nickel. For example, Cuba, Madagascar and the Island of Seboekoe, near Bor-

*Part I, Annual Report, Ontario Bureau of Mines, 1919.

[1]See Lateritic Ore Deposits, by W. G. Miller, Rep. Bur. Min., Vol. XXVI, 1917, pp. 318-334.

neo, all tropical or sub-tropical countries with a humid climate, contain nickel ore deposits of lateritic origin, that is, ores formed by the residual decay of the parent rock, such as peridotite or serpentine, the leaching out of the non-metallic minerals, and the consequent concentration of those of a metallic character. The well-known nickel ores of New Caledonia are of this kind; so, too, are the cobalt ores of the same island.

New Sources of Nickel Elsewhere.

A report recently issued in the Dutch language by the Mining Department of the Dutch East India Government gives particulars of large lateritic iron ore deposits recently discovered in the central portion of the Island of Celebes, in the Borneo Archipelago. These deposits are situated in the Verbeek Mountains, and are compared in composition and occurrence with those of Seboekoe above mentioned, resembling the latter in containing nickel, of which assays show from 0.27 to 0.64 per cent. It is estimated that the Verbeek deposits contain as much as 1,000 million tons of iron ore.

Nickel occurs along with copper, lead and cobalt in ore bodies now being worked by the Missouri Cobalt Company at Frederickton, Mo. These deposits are found at the contact of sandstone and limestone, and are in the form of flat beds, workable for a depth of two to eight feet. The ore contains 2 to 2.5 per cent. copper, 0.5 to 0.8 per cent. nickel, 0.5 per cent. cobalt, together with lead and a little silver. All the metals are present as sulphides, and are associated with considerable pyrites. A 300-ton mill has been erected by the company, in which the ore is concentrated, four or five parts into one, by gravity concentration aided by flotation, 85 to 95 per cent. of the metals being recovered in the concentrates. The concentrates are roasted and smelted in a blast furnace, and the resulting matte is leached after roasting, the residue being converted into anodes. The copper is recovered by electrolytic refining, and the cobalt and nickel by chemical precipitation. The cobalt and nickel refineries began operation about the beginning of 1919. The nickel from these works is the first produced in the United States from native ore for a number of years.

In the Island of Santo Domingo a low-grade nickel deposit, called the Perseverancia Mine, has been opened up by Cuban capitalists. The work done in 1918 was principally in building houses and making roads.

At Insizwa,[2] South Africa, sulphides carrying nickel and copper have been found under geological conditions which have suggested to some observers a resemblance to those of the Sudbury field, but as yet there has not been development enough to prove the existence of any considerable bodies of ore.

More recently accounts have been printed describing the occurrence of sulphides containing nickel and copper at Vlakfontein, No. 902, in the Rustenburg district of the Transvaal, where the geology is also said to be suggestive of that of Sudbury. A huge laccolith of red granite is represented as being surrounded by a marginal fringe of norite and basic rocks, the norites being usually about six miles in width, but at points spreading out to a maximum of 70 miles. On or near the marginal zone, gossan outcrops show traces of ancient workings, evidently for copper. Where shafts have been sunk on these outcrops, the general experience has been that down to 40 feet the gossan is ill-defined, and carries nothing but traces of copper with occasional blocks of unaltered sulphide ore. From this depth nickel appears in conjunction with the copper as an irregular impregnation, becoming richer at 100 feet, the greatest depth yet reached. Assays of the ore at various openings and depths show 0.57 per cent. to 3.25 per cent. of nickel and 0.25 to 6 per cent. of copper. No large amount of work has so far been done, and no important bodies of ore located.

[2]See Rep. Roy. Ont. Nickel Commission, 1917, p. R278.

Iron and Sulphur.

The present treatment of the nickel-copper ores of Sudbury has for their chief aim the recovery of the nickel and copper contents. For this object the methods are efficient, and are carried out with much technical skill. The metallurgical plants are models of their kind, and their equipment is of the most modern type. Nevertheless, there are important constituents of the ore which go to waste. As it comes from the ground a ton of the ore contains on the average about 40 per cent. or 800 pounds of iron, and 30 per cent. or 600 pounds of sulphur. All of this iron and sulphur are lost. That is to say, in the 1,559,892 tons of ore which passed through the furnaces in 1918 there were 623,957 tons of metallic iron which was cast away in the slag. This is not much short of the entire annual output of pig iron from the blast furnaces of Ontario, amounting in 1918 to 751,650 tons.

The case is similar with regard to sulphur. Part of the sulphur is driven off in acrid fumes by heap-roasting in the open air, part is expelled in the smelting furnaces and converters, and part in refining the matte. But all is wasted. The Royal Ontario Nickel Commission, assuming an average of only 25 per cent. of sulphur in the ore treated, states[3] that at "the present (1917) rate of production not less than 300,000 tons of sulphur, capable of producing nearly a million tons of ordinary sulphuric acid, is annually lost, and does damage through being allowed to escape."

It is not intended to suggest that these losses are intentional, or due to neglect. In the present state of metallurgy they are doubtless inevitable. If these subsidiary contents of the ore cannot be recovered at a profit they cannot be recovered at all. Furthermore, the nickel mining companies have given much attention to the possibility of avoiding these losses, and it may be taken for granted that so far they have not found it practicable to do so. Freight charges play a large part in the problem of sulphuric acid manufacture, and the Sudbury smelters are at so great a distance from acid-consuming centres that the transportation charges would be insurmountably high, even if methods of trapping the sulphur fumes and converting them into acid were devised.

Yet it is evident that there is here an opportunity for the exercise of metallurgical skill and inventive genius. The need for thrift in the use of natural resources is becoming universally recognized, and we may hope that long ere the nickel-copper ores of Sudbury are worked out means to make use of both the iron and the sulphur will be found.

As a matter of fact the utilization of the iron contents of these ores has already made some progress. Attention was called in the Report of the Royal Ontario Nickel Commission[4] to the attempts which have been made to produce a nickel-copper steel by direct smelting. The presence of copper in steel has in the past been objected to as injurious, but this opinion is undergoing revision

[3]Report, p. 488.
[4]Report, pp. 413-422. See also Appendix.

in the light of practical experience, since it has been shown that a small percentage of copper may not only with safety, but possibly with advantage, be carried along with nickel in a nickel-steel. Theoretically, at least, nickel-copper steel may be obtained either direct from the ore, or by re-treating the slag from nickel smelting. The latter process would not only make use of the iron, but also of the small percentages of nickel and copper remaining in the slag, and would besides avoid the waste of the precious metals entailed by smelting the ore as it comes from the mine. On the other hand the smelting of slag is more difficult in practice.

The manufacture of nickel-copper or "Ni-cu" steel has been begun by Electric Steel and Engineering at Welland, Ont. Experimental bars and sheets have been made of good quality, and even gun tubes for the British Government.

The "Precious" and "Rare" Metals.

Besides the two metals of principal quest, the Sudbury ores carry platinum, palladium and other metals of the platinum group, also gold and silver. The latter two, when spoken of collectively, are usually referred to as the "precious metals," and for clearness sake, platinum, palladium, etc., may be called "rare metals." In point of value "rare metals" are at the present time worth per ounce six times as much as gold, and one hundred times as much as silver. Exact figures cannot be given for the precious and rare metal contents of the mattes produced at Sudbury, as these undoubtedly vary from year to year, being to some extent dependent upon the class of ores smelted. Certain deposits of the rocky type are richer in these constituents than the more massive ore bodies, and the whole subject of the association and method of occurrence of platinum, and especially of palladium, in the Sudbury ores, is as yet not thoroughly understood.

For the three years, ending in 1915, the average contents of the precious and rare metals in the Canadian Copper Company's mattes were 0.10 ounces platinum per ton, 0.15 ounces palladium, 0.05 ounces gold, and 1.75 ounces silver.[5] At this rate, the mattes produced by the Company in 1916, amounting to 56,405 tons, are estimated to have contained 5,640 ounces of platinum, 8,460 ounces of palladium,[6] 2,820 ounces of gold, and 98,709 ounces of silver. Of the precious metals a greater proportion is actually recovered than of the rare metals. For example, in 1916, as is shown in the table on page 30, the gold recovered amounted to 3,495 ounces and the silver to 110,285 ounces, in each case considerably more than the theoretical contents based on the average of the three preceding years, while of platinum the yield was 1,016 ounces, of palladium 1,345 ounces, and of rhodium metals 257 ounces.

In the Orford process of refining, the platinum and palladium pass into the nickel and Monel metal, and are thus lost, practically only those products which are treated electrolytically in the refinery yielding their rare metal contents. The gold and silver follow the copper, and are obtained in refining the blister metal. Recent experiments suggest the possibility of adapting electrolytic methods to the refining of nickel at certain stages of the Orford process, and if this can be successfully done, the production of the platinum group of metals from the Sudbury ores should be decidedly increased.

[5]Royal Ontario Nickel Commission Report, p. 484.
[6]Ibid, p. 484.

The Mond process of refining affords opportunity for a full recovery of these metals, which are concentrated in the residues. These are periodically removed, and have in the past been disposed of to the well-known firm of Johnson, Matthey & Company, of London, by whom it was refined. Recently the Mond Company have installed in their works at Clydach, Wales, a plant for treating the residues, and henceforward will be in a position to recover the precious and rare metals themselves. Analyses show this company's mattes to be richer in both the "precious" and "rare" groups than those of the International Nickel Company, but the quantities obtained have not been reported.

It should be stated that the known ore deposits which are specially rich in the rare elements, such as Victoria, Worthington and Vermilion, are few in number, and some of them small in size, and consequently cannot be depended on for continued large production. The outlook is that future mattes may not assay so high in the rare metals as they have done in the past.

Improving Electrolytic Process of Refining.

Improvements have been invented in the electrolytic refining of nickel by George A. Guess, Professor of Metallurgy at the University of Toronto.

Professor Guess states it is found that if an anode of crude nickel, which may contain copper and iron, is electrolyzed in a bath of nickel sulphate in which is suspended finely divided calcium carbonate, there is deposited on the cathode, which is suspended in a sack diaphragm, metallic nickel practically free from copper and iron. The copper is precipitated as a double basic sulphate of copper and nickel, which is quite insoluble. The function of the diaphragm is to protect the cathode from mechanical pollution by contact with the insoluble copper salt. Since an equivalent quantity of nickel is combined with the copper in the insoluble basic sulphate, it is obvious that the copper content of the anodes should be as low as possible. Preliminary treatment of the converter matte to remove copper is necessary. Two methods at once suggest themselves for doing this. The first is by leaching the roasted matte with dilute sulphuric acid, as is done in the preliminary operation for the Mond process. The second method would be a fusion with coke and salt cake ($Na_2 SO_4$), which is the preliminary step in the Orford process.

Experiments have been made with Prof. Guess' process at one of the Sudbury smelting plants, which are said to have been successful, and it is hoped that a more extended trial will be made. A threefold advantage is claimed for the process; it saves time, it reduces the cost of refining, and it enables the gold, platinum, etc., to be recovered.

A FACTORY FOR PUTTY MANUFACTURE.

A plant has been established at 17 Jarvis St., Toronto, by the Toronto Putty Co., exclusively for the manufacture of putty. This is probably the only plant in the Dominion engaged exclusively on putty manufacture.

ALCOHOL AS A FUEL.

The distillers of Scotland, it is reported, have made a definite move to produce power alcohol, and it is anticipated that 30,000,000 gals. from home production should be possible within a reasonable period from the laying down of new distilleries.

ARSENIC

Arsenic has been recently quoted at 10½c to 11c per pound, an increase over the prevailing price of last fall, when arsenic was quoted at 9½c, as against pre-war prices around 4 cents. There is evidently a sustained demand for this material. The following statements are intended to summarize briefly some particulars regarding arsenic.

Commercial arsenic is the white arsenious oxide (As_2O_3). This is the form in which it is generally marketed, as the uses of arsenic usually demand its industrial application in this form. Arsenic as an element fiinds rather restricted use in the hardening of lead shot, where it is to some extent replacing the use of antimony, while white arsenic is employed in a variety of manufacturing processes, chief of which is the manufacture of insecticides and sprays. The poisonous nature of most arsenic compounds, the commonly known ones being paris green and lead arsenate, and its relative cheapness, make arsenic a material suitable for this purpose. The stimulation of agriculture during the war greatly increased the demand for arsenical insecticides. Glass-making consumes a large amount of arsenic, as it has been found to impart increased brilliancy to the glass. Crude commercial arsenic is often used to kill weeds along railroad tracks. Arsenious oxide is used also for preserving hides, while the disulphide, (As_2S_2), finds an application in dehairing hides for the finest grade leather, as it least affects the product. Orpiment (As_2S_3), is used in textile dyeing. Wall paints and wall paper formerly consumed considerable arsenic in the form of paris green, but this use has been largely given up, due to the poisonous nature of the dust from the product. Sodium arsenate, for a similar reason, is now little used in calico printing, where it had found application. The great objection to arsenical dyes and paints is the risk of poisoning from use of the manufactured article. Sodium arsenate is the principal poisonous ingredient of many cattle and sheep dips. Arsenic compounds are also used medicinally.

A prominent use of arsenic in Australia is destroying the prickly-pear plant. A recent announcement* has called attention to the State distribution of domestically produced in the arsenic mine at Jibbinbar, which is operated by the State for the purpose of producing arsenic for agricultural purposes. Ten tons of arsenic is produced weekly at this local mine and distributed by the Department of Lands and sold to settlers at about $50.00 per ton plus the cost of transportation, with the understanding that the arsenic will be used for the destruction of the prickly-pear pest. The difference in the value of the arsenic will be made up to the producers by the Land Department out of appropriations. The reported price of arsenic in the London market has been between $290 to $340 per ton. In combating this pest, which has grown to an alarming extent in Australia, a mixture of 15 pounds of common salt, 10 pounds white arsenic and 4 pounds caustic soda is used; a teaspoonful of the powder is placed in an incision of one of the lower leaves of the plant. Diluting this mixture with 100 gallons of water gives a spray that accomplishes the same result. The chemical destroys the tissue of the plant, which then dries and can be burned.

*Commerce Reports, January 24, 1920.

Production.

Arsenic is a common constituent of minerals and is present in most ores mined in the Western United States. It has been estimated that about 12 per cent. of all minerals known contain arsenic. However, there are very few localities where ore is mined for arsenic alone, it being chiefly obtained as a by-product in the mining and reduction of other metals, notably copper. In fact this source of the element has been subject to great wastage, and, according to Hess,* possibly 20,000 tons of arsenic trioxide are annually lost in smelter fume. He also estimates that some 5,000 tons of arsenic contained in foreign ores and unrefined metals shipped to the United States for treatment, is unused each year. The resources of the United States or of Canada, have never been taxed in the production of arsenic.

In recent years the quantity of arsenic produced in the United States has been around 6,000 tons annually, but the product has greatly increased in value.

The three chief producers of arsenic in the United States are the American Smelting and Refining Company at Denver, Colo., Tacoma, Washington, and Perth Amboy, New Jersey; the United States Smelting Company at Midvale, Utah, and the Anaconda Copper Mining Company at A. S. and R. Co. plants in the West. The Tacoma plant of the A. S. and R. Co. has been recently shut down, but formerly smelted the bag-house products of the other A. S. and R. Co. lpants in the West. The Tacoma plant of this company smelts arsenical gold concentrates from British Columbia. The Anaconda Copper Mining Co. has installed a new Cottrell precipitation plant to treat the smelter fume and deliver a purer arsenic product and which requires no additional refining.

The largest quantity of arsenic imported into the United States comes from Canada, where it is derived, as a by-product, from the smelting of ores in the Cobalt district. Imports of arsenic compounds for the first eleven months of 1919 totalled 321,706 pounds, against 1,248,380 pounds for a similar period in 1918.

Agricultural requirements of arsenic in South Africa are being partly met by the production of arsenic in Rhodesia, where the material is produced commercially and shipped to the Union of South Africa for manufacture into arsenite of soda to be used in sheep dips. A significant point about the development of Rhodesian arsenic resources is that prominent British interests are concerned in the future development and possibilities of the arsenic industry in that part of Africa. Thus the Goldfields Rhodesian Development Co., Ltd., in which company the Consolidated Goldfields of South Africa, Ltd., is interested, has been instrumental in organizing a new company to be known as the Standard Arsenic (South Africa), Ltd., and which will operate extensively in Africa. The production of arsenic in Rhodesia has been relatively small, and, in 1918, amounted to 114 long tons.—From U. S. Bureau of Mines, Monthly Reports of Investigations, by F. E. Wormser.

Note—During the year 1918, the Province of Ontario produced 5,090,818 pounds of arsenic, crude and white, valued at $566,332. In 1917 the value of arsenic produced in Ontario was $608,483. This was a large increase over 1916, when the value was $200,103, and of $148,379 for 1915. The large increase was due to war-time pressure.

[1] U.S. Geological Survey, Mineral Resources, 1914.
[2] U.S. Geological Survey, Mineral R sources.

MOLYBDENUM IN CANADA.

The following memorandum regarding molybdenum has been prepared by the Natural Resource Intelligence Branch of the Department of the Interior:—

A recent article in the London Times directs attention to the increasing importance of the use of molybdenum in steel and to the world's deposits of ores of this metal. It seems undoubted that molybdenum may shortly attain an importance exceeding that of tungsten and other rare metals in the manufacture of steel alloys. Molybdenum steel is the lightest and strongest steel that has yet been produced. Recent discoveries in metallurgy by Dr. Arnold and others serve greatly to emphasize the advantages of this metal. Once convinced on this point the steel manufacturer promptly turns to sources of supply. He will require an assurance of quantity production for a period of years at a reasonable rate. Canada can meet these conditions on terms comparable to those of any other country in the world. Under these circumstances, users of this metal within the Empire do not need to seek their supplies from outside sources.

There are over one hundred known occurrences of molybdenite in Canada. Some of these have been developed and in certain cases have proved remarkably productive. During 1916 and 1917 the annual production of one Canadian molybdenum mine exceeded that of any other individual mine in the world. Post-war depression and an unassured market are responsible for the present relative inacitvity. During the greater part of the war Canadian molybdenite was sold at a price below that prevalent in the United States. Yet production under controlled prices was so profitable that in 1918 it amounted to 189 tons, nearly one-third of the world's production that year. For this increase, credit is largely due to the Department of Mines, Ottawa, which after exhaustive investigations introduced a highly satisfactory system of concentration for this ore. Conditions for continued production in Canada are excellent. Good mines in working order close to railways and concentrating mills can furnish concentrates, and electric furnace plants are available for the production of ferro-molybdenite in quantity as required. For the manufacture of the latter, unrivalled water-powers offer unusual facilities.

In an article on molybdenum by Alfred W. G. Wilson, of the Department of Mines, Ottawa, the following statement is made:—

"Cheaper power and high ocean freights will make it possible for discriminating purchasers to secure their supplies of ferro and other alloys in Canada at lower rates than they con be produced in existing European plants. Steel makers in general still refrain from using this metal, except in small quantities for certain purposes in which the technology is well developed. Molybdenum steels found many uses in the Allied countries during the war, and it is to be expected that sooner or later the results of careful and intensive investigations that have been made will be available for commercial purposes. In the United States it was employed in the crankshafts and connecting rods of the Liberty motors. It has also been employed experimentally in certain automobile parts and in tools. It is stated that the Ford Motor Company, which has been interested in the development of molybdenum steels, was preparing to produce a thin armour plate containing approximately 1 per cent. molybdenum, for use in armouring tank cars. This armour was made 1 inch thick, and while not directly specified by the Government, it would have been accepted for the reason that the steel conformed to the tests required by the regulations of the War Department."

The development of the molybdenum steel industry depends in large measure upon the success the world's steel manufacturers meet in procuring supplies of molybdenum and it may be reassuring to them to know that a regular market for this metal is just what is desired by the molybdenite mining companies of Canada in order that production may be renewed with increased activity. Accordingly the steel interest in Europe and elsewhere need not have any doubts as to the capability of the important molybdenite firms of Canada to fulfill any contracts that may be with them for regular supplies of molybdenite.

CATALOGUES AND REPORTS RECEIVED.

Hilger Instruments in Industry.—This is an eight-page booklet, dated January, 1920, gotten out by Adam Hilger, Ltd., 75a, Camden Road, N.W.I., London, Eng., scientific instrument makers, describing the industries to which their instruments are applicable. The application of optical instruments to the problems of industrial chemistry is rapidly progressing and extending. The company's research laboratories are keeping in touch with the latest developments and brief reports with references to literature on the subject will be sent to those interested in any of the specific applications of the instruments. As to chemical manufacturing the uses of the Abbe Refractometer, made by this company, is recommended in large scale manufacturers such as acetic acid, cream of tartar, saltpeter, carbolic acid, all of which can be analysed with the aid of the Abbe. It is also useful for control in the manufacture of ammonium sulphate, ammonia, etc., and generally in the analysis of solutions of salts. The Polrimeter is an instrument continually useful to manufacturers of tartaric acid, alkaloids, sugar, starch, resin oil, castor oil, and essential oils. The principal instruments made by Adam Hilger, Ltd., for use in industry and concerning which catalogues may be obtained from the company are —Wavelength Spectrometer, Nutting Photometer, Polarimeter, Abbe, Refractometer, Saccharimeter, Wilson Projection Comparator and the Quartz Spectograph, sizes, A, C, and D.

Braun Laboratory Appliances—Catalogue No. 50, descriptive of the varied line of laboratory appliances of this Los Angeles, Cal., firm, the Braun Corporation. 99 pages, illustrated with price list enclosed. Crushers, grinders, muffle furnaces, etc., are described.

The Hardinge Conical Ball and Pebble Mills—Catalogue No. 7. Sections I.-VI. A well illustrated catalogue showing the uses of these grinding mills to the chemical and allied industries. A request to the Hardinge Company, 120 Broadway, New York, will bring you a copy.

Stuart and Peterson Co., Burlington, N.J.—Catalogue No. 221. A 144-page catalogue describing the products of this New Jersey firm. Kettles, autoclaves, emulsifiers, pans, tanks, etc., are illustrated.

INDIA AND AMERICAN DYES.

Representations made by the American Chamber of Commerce in London have resulted in the Government of India instructing their customs officers to admit freely into India prohibited dyes and dyestuffs ordered before September 6 from other than ex-enemy countries, and shipped before January 1 next. The Australian Government, a few months ago, granted a period of grace amounting to 3½ months.

Chemical, Oil, and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

As compared with January the trading in heavy chemicals during February shows a slight decrease. Just what has caused this is somewhat difficult to say, but the chief reason would seem to be that the recent advances in prices have caused purchasers to hold back in anticipation of weakening quotations. We cannot see where there is much prospect of a decrease for some weeks at least. Production costs are steadily mounting, and the only factor that can reduce prices will be a lowering of the exchange rate on Canadian money in the United States. And this will affect only those products which we now have to import from across the line and those chemicals of which we have to import a constituent. There is no sign of any slump in trade, however, the slight decrease in orders being simply a cautious move on the part of buyers.

In the United States transportation difficulties are a serious factor in the trade. Some plants have been forced to close down on this account, and the railroads are declaring embargoes until they have the terminals free of congestion.

Sulphuric Acid.—Sulphuric advanced a quarter of a cent during the month, and is now quoted at $3 per 100 lbs. The exchange has affected the cost of sulphur, and that, added to increased cost of manufacture, has caused the rise.

Muriatic Acid.—Muriatic also advanced a quarter of a cent, and now brings $3 per 100 lbs. There is no immediate prospect of a drop in either sulphuric or muriatic. Transportation difficulties in the United States have prevented very large shipments, and an active demand for both acids is reported in New York.

Alcohols.—Pure alcohol has advanced $1.50 during the month, the lowest quotation on the pure alcohol, 65 per cent. o.p., being $10.50 per gallon. Reports from Chicago and New York show the alcohols to be advancing rapidly. Spot stocks of methyl alcohol were practically exhausted in Chicago last week. Wood alcohol is quoted in Toronto at $3.25 per gallon, an advance of 35 cents. Methylated spirits have advanced to $2 per gallon in bbls. The prospects are that the alcohols will advance again during the month. Indeed, as we go to press one wholesale house is asking $11 for the pure, 65 o.p.

Battery Acid.—There is a splendid demand for battery acids, and prices have advanced. The motor car plants are doing a good business in Canada at present, resulting in a consequent heavy demand for battery acids.

Pharmaceuticals.—Pharmaceuticals, with few exceptions, have advanced during the month. There is a shortage of menthol supplies throughout the world, and a constant increase in the demand, particularly in the United States. The coming crop of camphor is expected to be far below the consumption, as indicated by the use of the material in previous years. It has been estimated that the reserve of the 1919-1920 crop which will be held in Japan will be about 133,500 lbs. of crystal and oil at Yokohama and Kobe, and 200,000 lbs. for stocks in the producing areas, and, added to this, it is estimated that 200,000 lbs. will be required to meet the Japanese domestic demands. On the basis of the average quantity taken annually for export since 1912, exports for the season will total about 726,000 lbs., thus making the total requirements for export, Japanese consumption and stocks, about 1,259,500 lbs. for the season. The estimates show a considerable decrease in the output of Japan, owing to the fact that in some districts the farmers prefer to plant rice and other cereals on account of the high prices, and owing to the loss in the Hokkaido district of a considerable part of the crop through severe cold weather.

Fertilizer Materials.—While the long winter season has delayed orders to some extent from the farms for fertilizers, yet the trade is looking forward to a splendid season this spring. The prospects are that the farmers, once the winter is really gone, will purchase fertilizer materials in larger quantities than in any previous year. The reports from salesmen on the road would indicate this. Prices have remained practically the same during the month. The supply of phosphate rock in the United States is being relieved as production increases, but the supply has not caught up with the demand for this spring's trade at least. Operators of the phosphate rock fields in Florida found it very difficult to get laborers back to the fields following the war, and it has been necessary to conduct advertising campaigns and to offer attractions in the way of better housing. Quotations on Florida hard rock, 75 per cent. per ton, are $13.50 f.o.b. Inglis and $15 f.o.b. Fernandina.

Metals.

Steel.—The plant of the Dominion Iron and Steel Co., Sydney, N.S., is now turning out steel plates for shipbuilding. The work commenced during the third week in February, and it is stated that the product is the equal of any plate produced in the world. In the United States there has been a shortage of materials in the steel trade, caused by uncertain production, car shortage, and a big demand. Consumers of steel and steel products have been busily engaged in bidding for quick deliveries, with the result that some top prices are being noticed.

The ship-plate mill of the Dominion Iron and Steel Co. at Sydney will have a production capacity of 12,000 tons per month. The Federal Government has agreed to take 50,000 tons a year for five years at $3.65 per 100 lbs., with the option of increasing the amount to 375,000 tons. Plates of standard type from 3-16 to 2¼ gauge can be made up to widths of 98 inches, and in lengths to 80 feet. Transportation difficulties in the United States has greatly hampered delivery of steel lines not yet made in Canada. Prices of steel in Canada are on the upward grade, and there seems to be no signs of relief in sight, as just as soon as the United States railroads get back into the market for their expected prolonged building pragramme, which is scheduled to begin next fall, shipments to Canada will be just as difficult to get as now.

Flotation Oils and Naval Stores.

Due to the fact that the new supply of gum will soon be running in the South rosin has dropped in price. The rosin market is always affected by the new crop of gum, and the fact that open weather is predicted in the South the gum may be running in another two weeks' time. At Toronto the best grade of rosin, the W. W. (water-white), is now selling at $25.50 per bbl. of 280 pounds in barrel lots, a drop of $2.50 since February 10th. Turpentine has advanced again after a slight drop last week, and is quoted at $3.25 per gallon.

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Acetic acid, commercial, crude, 28% in bbls.	Lb.	.04½—.05½
Acetic acid, refined	Lb.	.18½—.19½
Acetone	Lb.	.18½—.23½
Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 2.00
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.25
Alum, Ammonia, lump and ground	100 Lbs.	.. — 5.00
Aluminium Sulphate, high grade, bags	100 Lbs.	3.25— 3.50
Ammonia, Aqua 26	Lb.	.10½— .16
Ammonium Carbonate	Lb.	.. .17
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Arsenic	Lb.	.. — .09
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. 1.15
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Caffeine, English	Lb.	.. — 8.50
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	30.00
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Camphor Monobromate	Lb.	.. — 5.75
Carbolic Acid, white crystals	Lb.	.. — .25
Carbon Bisulphide, in drums	100 Lb.	.22— .25
Carbon tetrachloride, drums	Lb.	.20— .24
Caustic Soda, ground, bbl.	Lb.	5½— .06
Chalk, Precipitated	Lb.	.04¼— .06
Chloroform	Lb.	.45— .55
China Clay, imported	Per Ton	20.00—25.00
Citric Acid, domestic, crystals	Lb.	.. — 1.15
Cobalt Oxide, black	Lb.	.. — 1.65
Copperas (Iron Sulphate) crystals	Lb.	.02¼—.02½
Copperas (Iron Sulphate) sugar	Lb.	.. —.02½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.11¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.05
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.40— .45
Formaldehyde	Lb.	.. — .45
Formic Acid, 75%	Lb.	.40— .42
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Glycerine, drum, C.P.	Lb.	.. — .28
Hydrofluoric Acid, 60%	Lb.	.. — .25
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.04¼—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	.. —70.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	.. —65.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Naphthaline flake	Lb.	.10— .11
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Oxalic Acid	Lb.	.25— .26
Oleic Acid	Lb.	.. — .23
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potasslum, Bromide, granular	Lb.	.. — 1.10
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash). Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.75— .85
Phenacetin	Lb.	3.10— 3.25
Quinine	Oz.	1.02— 1.50
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Saccharin	Lb.	4.75— 5.00
Salicylic Acid	Lb.	.75— .90
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.2¾— .03
Sodium Acetate	Lb.	.14— .16
Sodlum Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodlum Nitrate, refined	100 Lbs.	6.75— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Benzoate	Lb.	.. — 1.25
Sodlum Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.19— .20
Sodium Bisulphite, powder	Lb.	.. —.08½
Sodium Nitrite	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodlum Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.65
	Per Cwt. in Car Lots	.. — 1.60
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Stearic Acid, Triple Pressed	Lb.	.. — .42
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphurlc Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Sumac extract llquld, dark	Lb.	.. — .08
Sumac, extract liquld, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	..—18.00
Tannic Acid, commercial	Lb.	.75— .85
Tartaric Acid, crystals or powdered	Lb.	.78— .80
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.. —.08¼
Ultramarine, Blue	Lb.	.18— .45
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
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Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Fluorspar, ground	Ton	.. —30.00
Fluorspar, ground	Lb.	.. — .06
Fluorspar, lump	Lb.	.. — .05
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.09¾
Lead, in car lots	Lb.	.. —.09½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.40— .45
Platinum, pure	Oz.	155.00—160.00
Silver, bar	Per Troy Oz.	.. —1.34½
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
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Tin	Lb.	.. — .73
Zinc, sheets	Lb.	.. —.12¼

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Motor Gasoline (service stations)	Gal.	.. — .35
Lighting Gasoline	Gal.	.. — .37
Naphtha	Gal.	.. — .31
Coal Oil	Gal.	.. —.21½
Fuel Oil	Gal.	.. —.09½
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 2.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 4.75
Crude Creosote Oil	Bbl.	16.00—18.00
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Crude Coal Tar	Bbl.	.. — 7.25
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Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
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Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	2.57— 2.70
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	2.60— 2.73
Gums—		
Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .21
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
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February, 1920.

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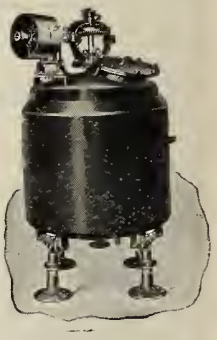

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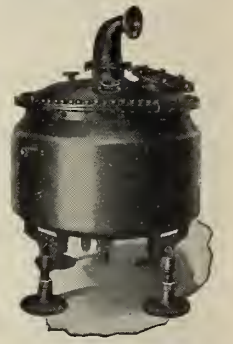

Glass Lined Steel. Tapering Gooseneck. Jacket and Enameled body of still are welded into one piece: top head bolted on and fitted with sight glasses; manhole cover secured by either swing bolts or through bolts. Tapering enameled gooseneck bolted to welded-on flanged nozzle in head. Flanged or threaded outlet through stuffing box in bottom of jacket. Various sizes and capacities.

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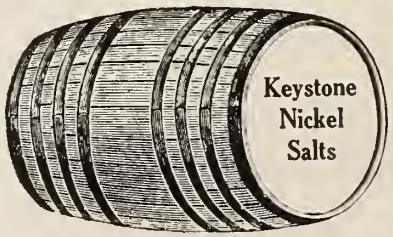

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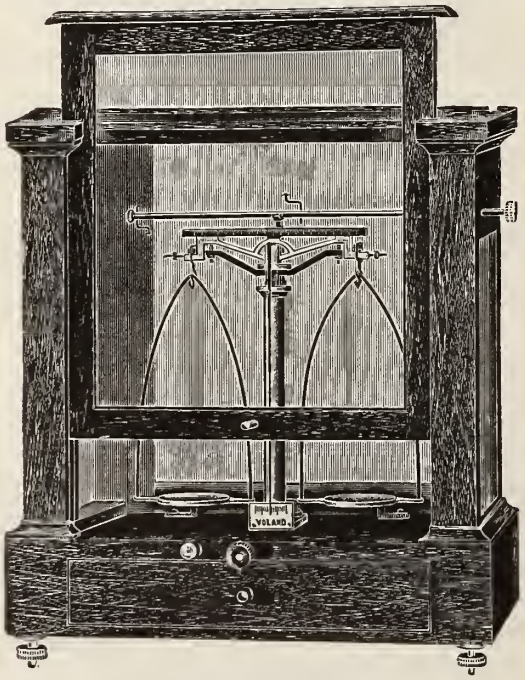

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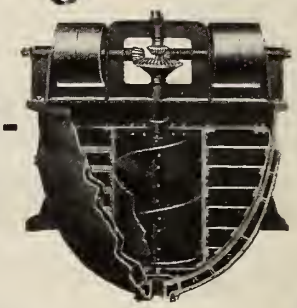

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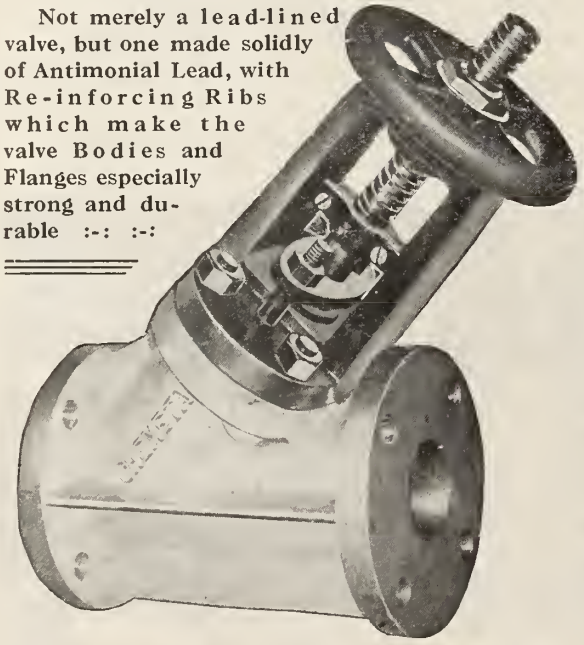

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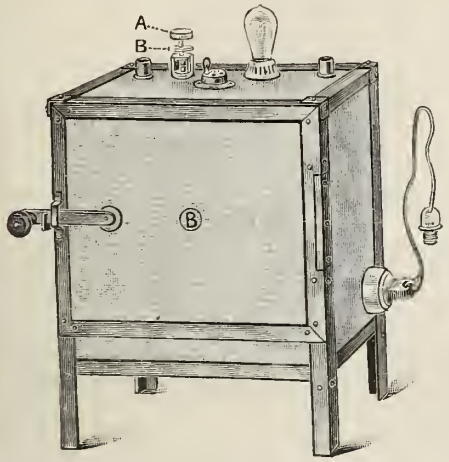

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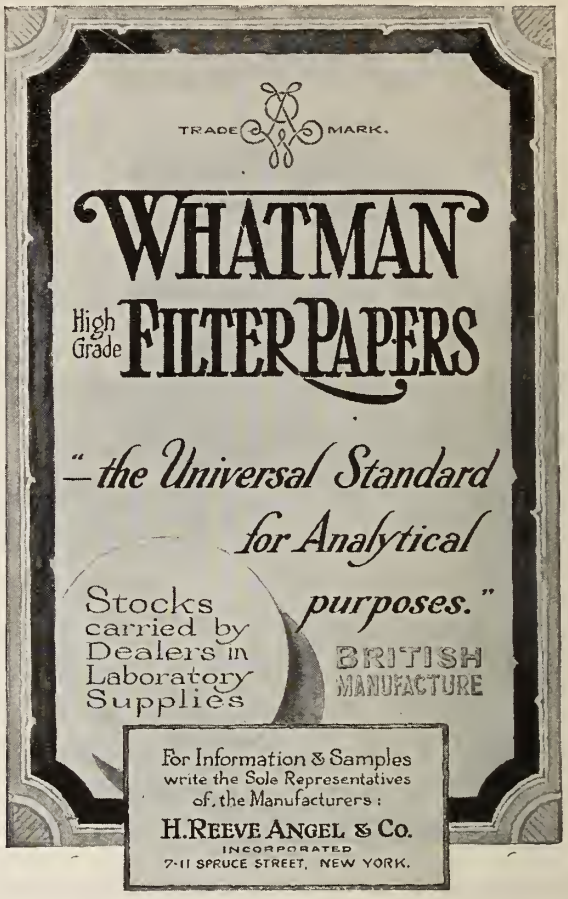
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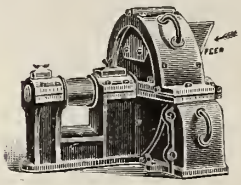

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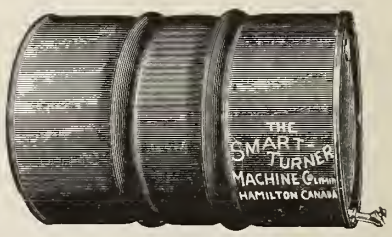

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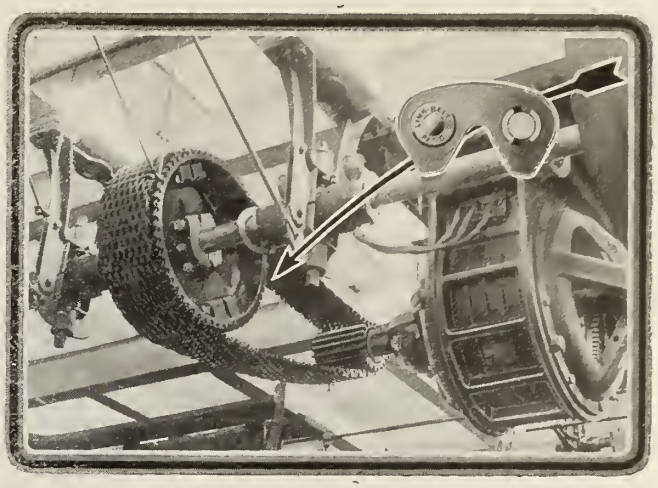

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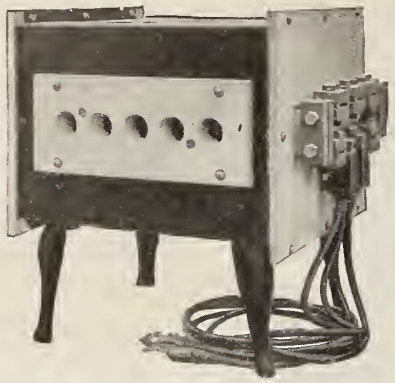

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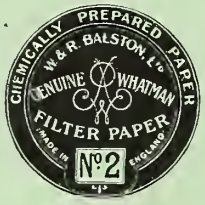

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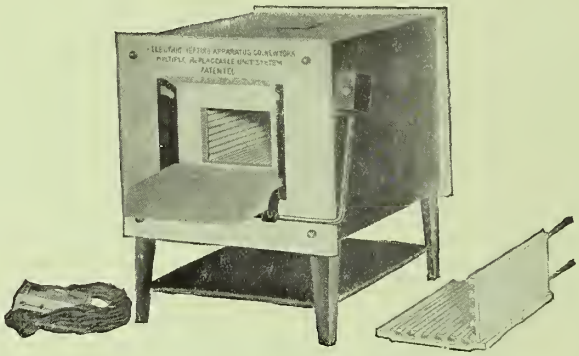

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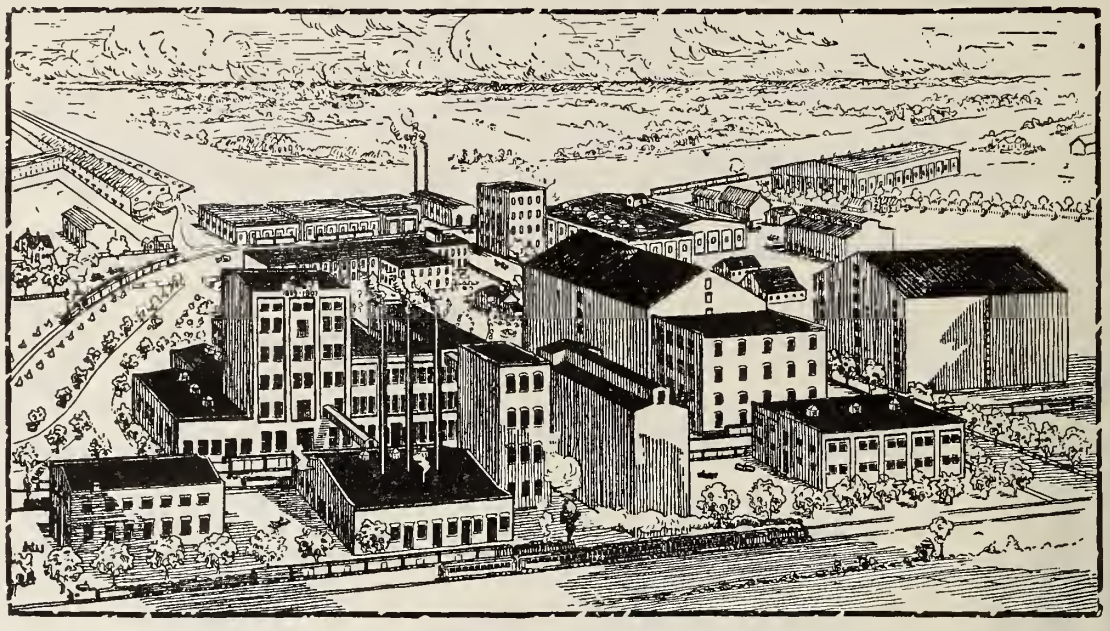

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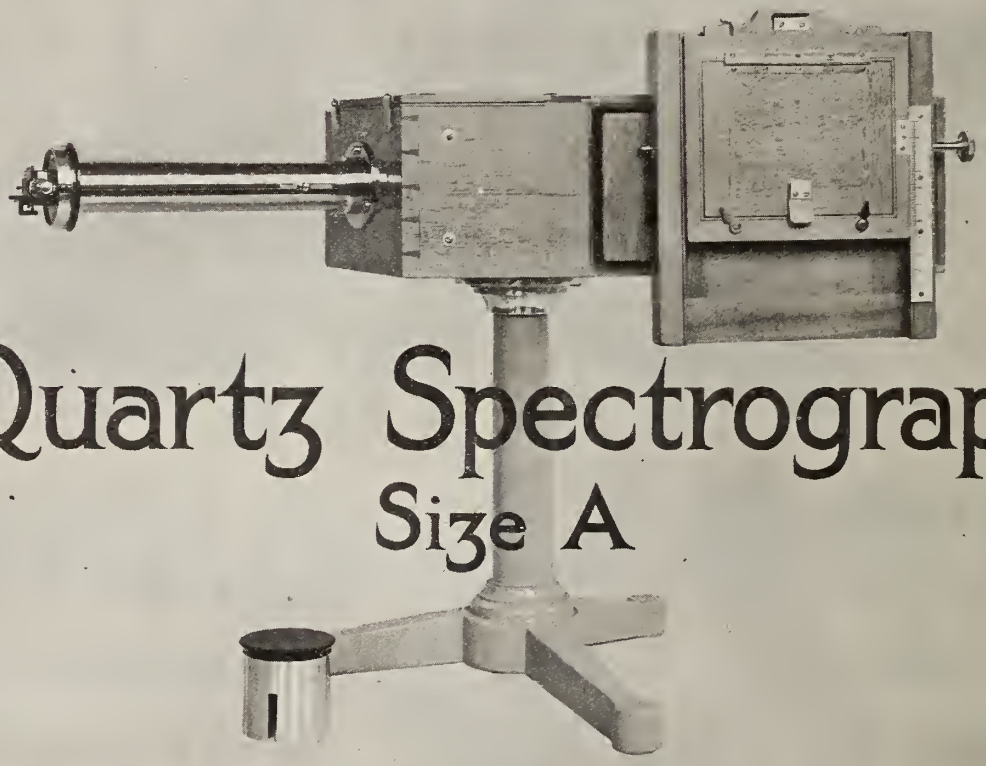

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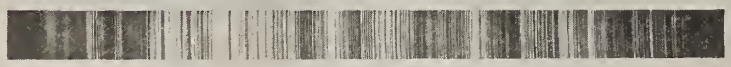
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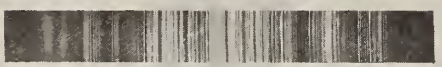
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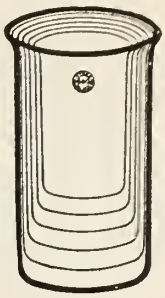

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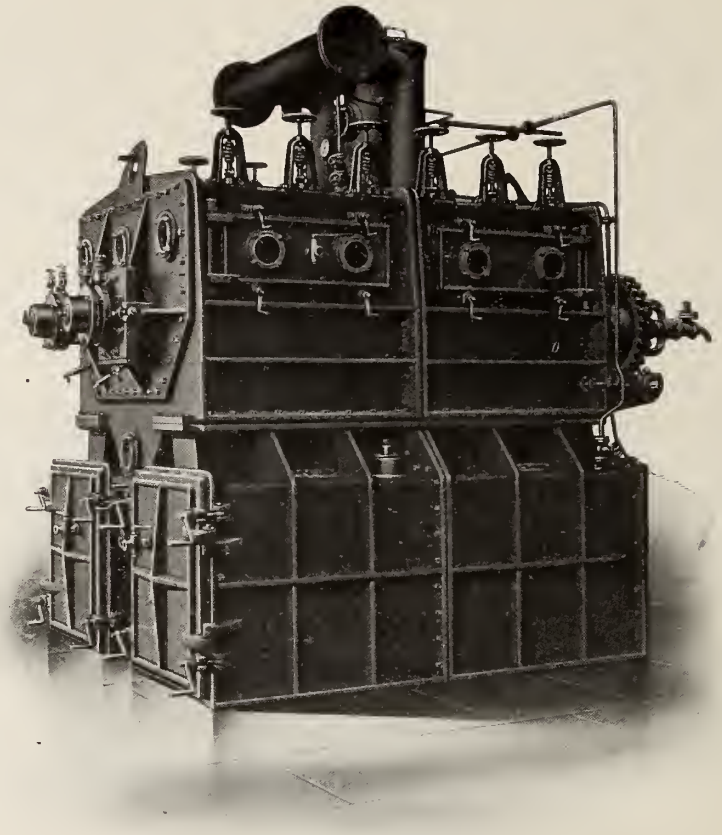

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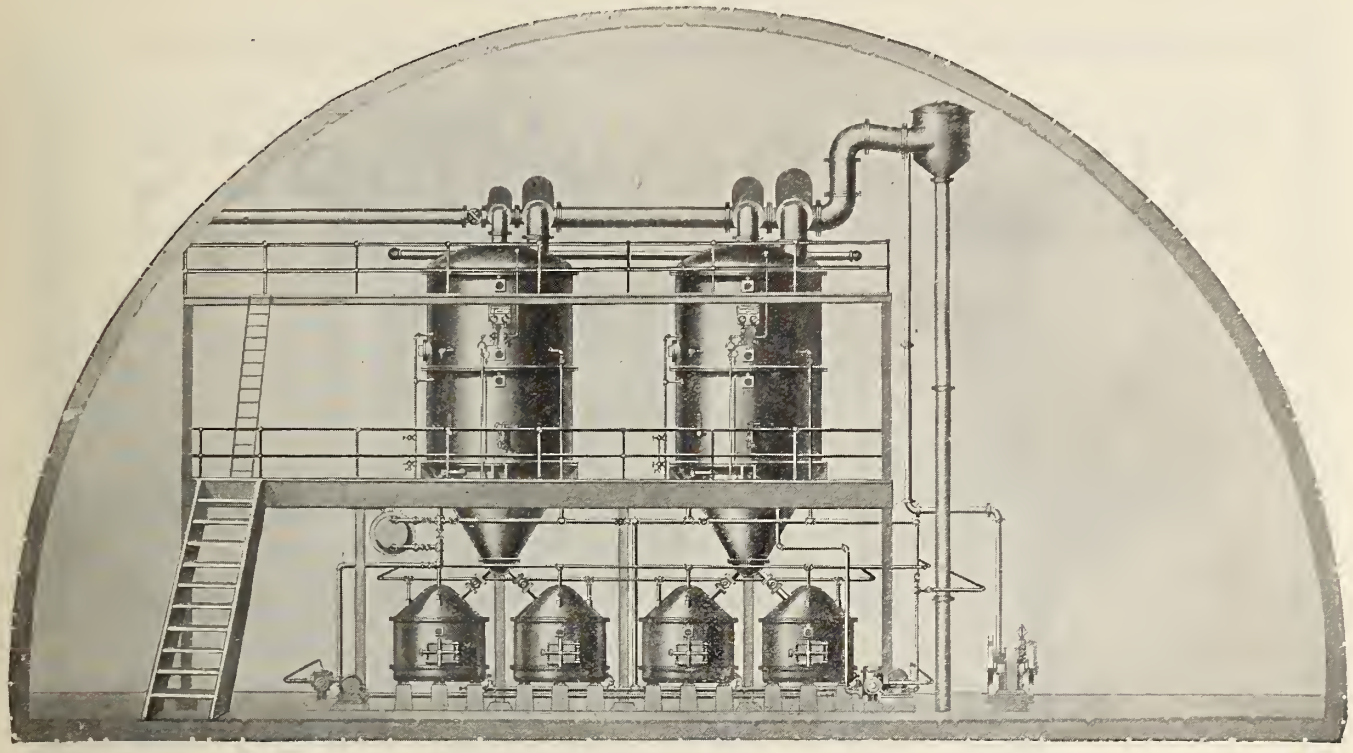

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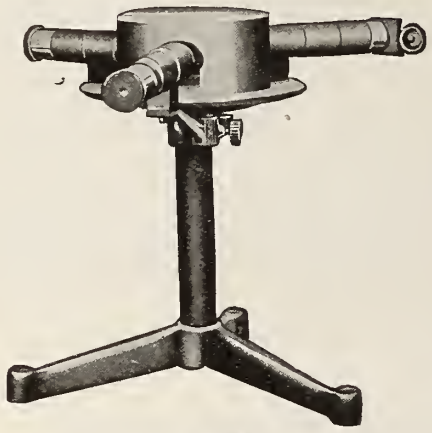

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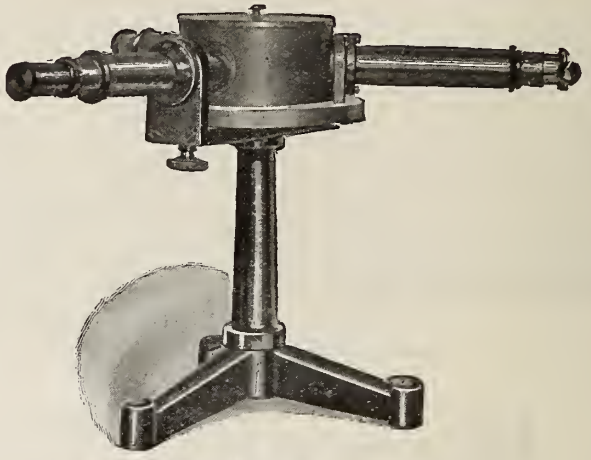

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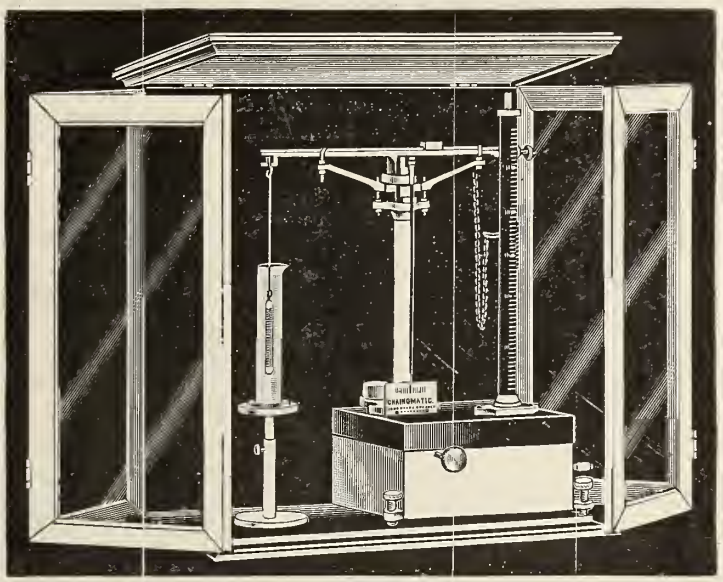

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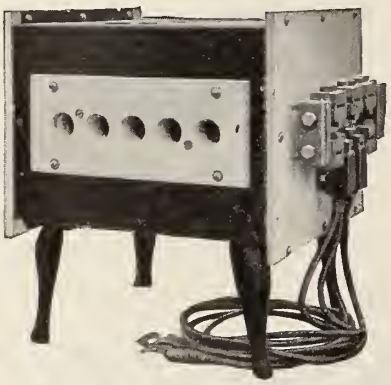

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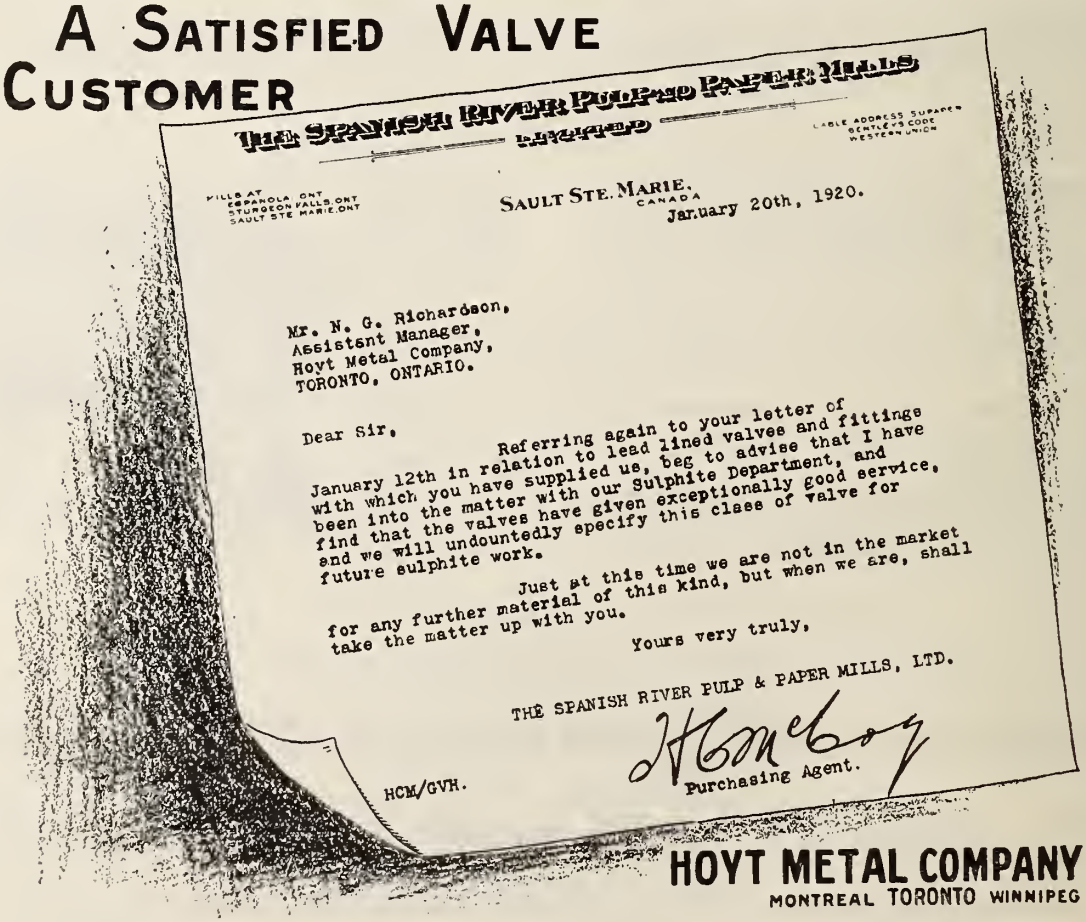
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Dear Sir,

Referring again to your letter of January 12th in relation to lead lined valves and fittings with which you have supplied us, beg to advise that I have been into the matter with our Sulphite Department, and find that the valves have given exceptionally good service, and we will undountedly epecify this class of valve for future sulphite work.

Just at this time we are not in the market for any further material of this kind, but when we are, shall take the matter up with you.

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THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 | TORONTO, APRIL, 1920 | No. 4

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Copies of January, February and July numbers for 1919 of The Canadian Chemical Journal are wanted. Full prices will be paid for copies received in good condition.

Address all communications to The Canadian Chemical Journal, 72 Queen Street West, Toronto, Canada. Telephone, Main 7399.

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EDITORIALS

THE COLOR TRADE IN CANADA.

CANADA is perhaps a larger user of dyes than might at first be considered. We are likely to remain a good customer of someone in this respect, and have contributed our share to the support of dye industries in the United States and Europe. With regard to the United States, we rank next to Japan as a consumer of American dyes. During one month recently Canada imported from the United States $72,744 worth of aniline colors, $13,898 worth of logwood extract, and $139,403 worth of all other dyestuffs. Imports from England are double what they were a year ago and run over $30,000 per month. British, Swiss and American companies are established through their agents in the Canadian market, and as the manufacture and use of dyes is something which concerns a whole class of chemists and is of such importance to all branches of the textile, as well as other industries, this number of the Journal is devoted in particular to color interests.

In a country where there are so many small users, it is only natural that some rather remarkable misconceptions be retained. Perhaps one of the greatest in the past has been that something was to be gained by purchasing mere bulk in a dye. It is usually possible to sell a so-called dye at any particular price within certain limits that may be required. The buyer, however, should not suppose that this seeming generosity on the part of the manufacturer or dealer is the result of a peculiar or native business ability inherent in the purchaser. If a dye is sold at a price below that which is reasonable for the purest form of the color, this low price must generally include the cost of a possible dilution of color value by some suitable filler. Going further than this it might often pay remarkably well if manufacturers would familiarize themselves more thoroughly with the dyehouse end of their business, going into the study with an enquiring mind.

As a consumer of dyes Canada is interested in following legislation, both in the United States and England, with regard to the protection of dye manufacturers. Very strong measures, designed to protect producers, have reached the American Government. The very strongest argument that may be used in behalf of protection for a dye and color industry in any country relates to the fact that those chemicals used in the production of dyes are exactly the ones which it is so necessary to have in times of war. If this is neglected a weak spot is created in the industrial fabric from a war-time angle. In England the expected progress of events is evidently taking place. There has been a crumbling of the wall that stood up so high against anything that came from Germany. Gradually, both indirectly and directly, German goods are reaching the United States and England, and it is not unreasonable to expect that trade relationships will eventually be fully established with only a nominal measure of protection, if any, extended to the general dye and color industries of the allied countries. The swamping of either British or American dye manufacturers by German goods is something that will not be allowed, or, at least, certainly should not be tolerated, if it were possible to do it, simply because of the weakness that would naturally follow from the loss of a leading "key" industry. While cheap dyes may be in the general interests of the textile trades, a world dye industry localized in Germany would be but a return to something we have paid much already to avoid.

WILL YOU EMPLOY A STUDENT THIS SUMMER?

WE have taken it upon ourselves to start something, believing that a definite student problem existed in Canada and that it should be solved. When courses in chemistry were given to only a few students, it was not so difficult a matter for either professors to find openings for students or for the men to locate an opening themselves.

The situation, due to several causes, has changed somewhat, and the question of locating graduates from our universities within the Dominion is perhaps as difficult of solution as any of our industrial problems, and the whole question of finding suitable summer employment for students in chemistry and chemical engineering should be made the practical concern of those who have in mind the value that such work might be to the student.

The attitude of those who commonly employ chemists or undertake chemical control of their operations has never been a generous one as far as students have been concerned. They have wished to obtain a finished product, capable of directing work or controlling it, without considering that it is hardly the function of any university to produce men capable of immediately giving such services. Manufacturers whose whole business may depend on chemical control have not conceived that they had any particular duty to perform. This is an unprofitable attitude on their part, and, without pointing it out too clearly, we can only say that as well as inviting students to

meetings and dinners and giving them, on all occasions, much reasonable advice regarding their future, they should adopt a constructive policy, and actually employ one or more students in chemistry during the long vacation.

This argument is not advanced with the idea that such a policy would necessarily be an unprofitable one from the viewpoint of the average company. Most students are willing, in fact anxious, to work, and work hard, which is something that is not a characteristic of all modern labor.

The Canadian Pulp & Paper Association in Montreal, has made some progress along these lines, and, according to their secretary, Mr. A. L. Dawe, placed some thirty students in pulp and paper mills during the summer of 1919. The result of this experiment has been very successful, from the viewpoint of the companies concerned, and the students employed. It is this idea which should be adapted more generally by Canadian industries.

If you are engaged in chemical work, we ask you this year to make an experiment along these lines yourself. If you have never had a chemist in your organization, we urge you to correct that condition at once.

Elsewhere in this issue we are announcing the measure of co-operation this Journal is willing to give in the matter. Our appeal is made here to Canadian manufacturers that they strain a point if necessary and give a larger number of students in chemistry and chemical engineering attending our universities a real opportunity this summer to gain a knowledge of industrial work, which will not only be of the greatest value to them now, but will allow them to grasp much earlier in their career that experience which is essential to them and to you, if they are to eventually guide and control our industrial chemical operations.

Once again—let us have action and co-operation in this matter by actually doing this thing that is so much in line with the brilliant generalities that are so often heard regarding the road to industrial success and which has, at the same time, a dollar value well worth considering.

GROWTH OF THE INSTITUTE OF CHEMISTRY.

NEARLY a year has passed since the Canadian Institute of Chemistry actively entered the field for members, and the response has been quite gratifying. Undoubtedly the fact that the Institute represents Canadian Chemists nationally from coast to coast and is distinctly Canadian, has assisted much in the good development to date.

Very recently the Institute has been granted the esteemed honor of enrolling His Royal Highness, the Prince of Wales, as an Honorary Fellow. In connection with this recognition of the Chemists of Canada, we are reproducing the letter of acceptance of the Prince and the reply of the Council of the Institute.

17th Feb 1920

St James's Palace S W

Dear Sir

I am desired by The Prince of Wales to state that His Royal Highness will be very pleased to become an Honorary Fellow of the Canadian Institute of Chemistry

Yours faithfully,

Godfrey Thomas

Private Secretary

Harold Roast, Esqre.,
393 Guy Street.
Montreal

March fifteenth,
Nineteen-Twenty.

Godfrey Thomas, Esq.,
Private Secretary,
His Royal Highness, the Prince of Wales,
St. James's Palace,
London, S.W., England.

Dear Sir:—

I am instructed by the Council of the Institute to say that we duly received your communication of the 17th ulto, acquainting us with the fact that His Royal Highness, the Prince of Wales, has accepted the invitation of the Canadian Institute of Chemistry to become an Honorary Fellow. The Council of the Institute would ask that you convey to His Royal Highness their very great appreciation of the honor conferred upon the Institute, and we desire to thank him for this recognition of the work done during the war by the Chemists of Canada.

Yours truly,
CANADIAN INSTITUTE OF CHEMISTRY.
(Signed) Harold J. Roast,
Secretary-Treasurer.

The Convention of Canadian Chemists at Toronto on the 27th and 28th of May will be the first opportunity for a gathering of members, and it is very essential from all viewpoints that occasion be taken to bring the Institute, its work and aims, to the attention of the whole chemist body in the Dominion.

There must always exist such a variety of interests in any profession that no one organization can hope to satisfy the requirements of all completely. At the same time there are so many valuable lines of service which it is the function of the Institute to further, that great interest is aroused in this first

Convention of Institute members. The well-chosen arrangement that the Institute should meet with members of the Society of Chemical Industry and representatives of other chemical organizations, is one which cannot help but work in the best interests of the whole Convention, and preparations are under way, by the Toronto members of these societies, which indicate a measure of enthusiasm that can result only in one of the most successful and largest gatherings of chemists ever held to date in the Dominion.

MEETING OF MINING INSTITUTE.

THE Canadian Mining Institute is an organization of technical men who represent, in one way and another, a very large field in which the present and future prospects of the Dominion are most bright. Their recent convention in Toronto brought together representatives from all the provinces. Statistics for the year 1919 show some falling off in totals, but this is most reasonable when the items are considered in view of their war uses. A country like Canada cannot be developed in a day by eight million people, who are, to a great extent, dependent on foreign capital for large scale industrial developments, but per capita, perhaps, more than average progress is being made.

From Nova Scotia to Northern Alberta and British Columbia we learn of opportunities for new development work, and even in Southern and Eastern Ontario, which has been under the eyes of geologists and oil seekers for a relatively long time, we find that all prospects have not been eliminated, and that the development of mineral claims of industrial importance may reasonably be expected.

Naturally, all eyes are looking with considerable expectation to the large possible oil fields of Mackenzie River Basin. While nothing startling has been reported, parts of the district are of such a geological nature that the oil prospector is assured that the fullest investigations are warranted.

In the matter of pure nickel coinage something of very general public interest was developed. Canadian coins of small value might well be revised as to size, and, with silver at its present price, it would seem only sensible to adopt a nickel coinage, more particularly when Canada is such a producer of this metal. While the Dominion Government has had this matter up before without action, the Institute will again press for this modification in the coinage, which, if passed, would be something that would be at once well received by the public.

No reference to this meeting of the Institute would be complete without mention of the rare privilege offered to the members by the International Nickel Company of visiting their plant at Port Colborne, Ont. To this privilege was added the kind hospitality of the company, as extended to those who were able to spend a most profitable day seeing how nickel is refined.

THE LATE J. C. KING.

[The following was received from Mr. Max M. Haff, Ottawa, just as we were going to press with the March number, and it was unavoidably held over until this issue.—Editor.]

An Appreciation.

J. C. King died, February 1, 1920.

Some time ago you gave in connection with your special number on Shawinigan Industries a note by J. C. King on the History and Manufacture of Carbide.

At that time there was naturally no reference to the moving spirit in the Canadian manufacture of carbide.

Now such reference is quite appropriate in the regretable event of the death of J. C. King, General Manager of the Canada Carbide Co.

In 1892, when T. L. Willson was working and discovered the electrical method of producing crystalline carbide, he was assisted by two men, namely, J. C. King and Edgar Price. Mr. Price stayed with the American carbide producers (U. C. Co.), and Mr. King came with T. L. Willson to Canada and started at Merritton to produce carbide commercially. At and from this time J. C. King practically built up the production of carbide until it reached the magnitude in evidence at Shawinigan Falls, that is, from a small 200 K.V.A. furnace, producing ingots of 400/500 pounds to the now large furnace of over 8,000 K.V.A. capacity, and in his own words (I quote from his description in this journal of August, 1919, page 263, of his present work to that of twenty years ago), the furnace construction was such, "that the electrical input is twenty times that of its prototype, while it turns out forty times as much carbide in a day; the electrodes used are forty times as large as the older type, and over twice as much carbide produced per K.W. day."

Mr. King's home was at Leaksville, N.C., U.S.A. He was richly endowed by Nature with the virtues of the typical Southern gentleman, one in real life of the type used in literature to exemplify all the courtly, generous, affable and kindly virtues, listening to others in trouble, helping them, encouraging them, not content with what he could do for himself, but with what he could do and give to others that they might be helped; his creed was unselfishness.—M. M. Haff, Ottawa, Canada.

CANADIAN IMPORTS OF DYES.

During the month of December, 1919, Canada purchased $576,041 worth of dyes and tanning materials from the United States, as compared with $485,474 for the same products in December, 1918. The imports of dyestuffs from the United Kingdom increased in even greater proportion, as in December, 1919, Canada imported $34,666 worth of dyes and tanning material from the United Kingdom, as compared with $16,077 during December, 1918.

UNITED STATES INCORPORATIONS.

In the period from August 1, 1914, to the end of 1919, drug companies have been incorporated in the United States involving capital of more than $500,000,000.

The Demands of Color Fastness on Cotton

No Absolutely Fast Color—Fastness an Indefinite Term—Bleeding—Fastness to Rubbing and Perspiration—Fastness to Bleaching, Alkalies and Acids.

By ALFRED BURTON, Hon. Secretary, Canadian Section, Society of Chemical Industry

THE fastness of colors is dependent upon certain destructive actions arising from causes which exert themselves in different manners. An absolutely fast color does not exist, so that the term "fast" is only to be used in a comparatively limited sense in regard to the degree with which the colors withstand these influences. We speak of fastness to light and atmosphere, to washing and milling, to rubbing and perspiration, to bleaching, to acids and to the alkalies. The dyer should be certain which of these tests are required of him before the selection of a dye, nay, should demand this information, else his reputation falls shattered to the ground and he is condemned in the eye of the public, and then we are told fast colors cannot be dyed at home. Let the ambition of a colorist be a reputation for quality, cheapness should be relegated to the man who goes for quantity only.

The production of uniform goods which have to withstand the action of light, air, and oftentimes rain, for the most part of a day, demand a different test for fastness than, say, an expensive silk which perhaps is never exposed to the rays of the sun, but only shows forth its beauty under the benign influences of artificial light, and perhaps is worn very seldom. In the production of carpets and curtains the fastness to light must be the leading test, whilst for knitted goods the choice of a color should depend upon its fastness to washing.

The researches of Chevreul have proven that even the same dyestuff has not the same fastness on all fibres. For instance, indigo extract is the fastest when dyed on silk and the most fugitive on cotton. Vat indigo blue is the fastest on wool and the least so on silk, whilst madder is the fastest on cotton. Therefore, because a dye is fast on any one fibre it is no criterion that it will be equally so on another. It is also phenomenal that saturated dark shades are faster towards light than the same dyestuff dyed in lighter or unsaturated tones. For example, take the superior alizarin colors, which have proven to be the most unsuitable for fast light-mode shades. It is also known that some dyestuffs, such as alizarin, madder and cochineal, give with all mordants fast colors, whereas young fustic produces with all mordants unstable colors, whilst logwood will give fast colors with some mordants and fugitive ones with others.

With regard to the artificial dyestuffs they may be arranged in groups conforming to their chemical constitution, and one may safely be sure that in accordance with the arrangement of the atoms within the molecule these groups will be productive of fast or loose colors, showing that chemical constitution seems to play a large part in determining the value of a dye, and most dyestuffs produced from a base such as anilin are mostly fugitive, whereas alizarin and its derivatives are mostly fast.

United Action of Light and Atmosphere.

The united action of light and atmosphere subdue every color, though some few only after a long lapse of time, noticeable by the gradual fading of the color. Indigo, world famed for fastness, gradually darkens during the first year, then gradually fades away, and it seems a truism that as the sun gives us our beauteous colors, so does it take them away. The dyer possesses no means of strengthening the fastness to light and air, except in the case of a few isolated colors, and yet the color must be more or less fast, especially in such goods as hosiery, underwear, corset covering, linings, etc., and in a much stronger degree in dress goods, awnings, etc. The only way of escape is the proper choice of the dyestuff, and to achieve this end the dyer must have recourse to an exposure test, made somewhat after the following manner:

A dyed sample is half covered with a thick removable paper covering and exposed to the light in the open air, being hung up in a locality where it shall receive the rays of the sun, but at the same time be protected from the weather. At specified times the paper covering is gradually pulled over the exposed portion, say half an inch at a time, until the last half inch is reached, when the gradual fading of the color may be seen at a glance by the removal of the covering and the time noted. For a standard the result may be compared with a sample dyed with indigo blue or turkey red. The samples are observed daily, and the day noted when the first change in color is noticeable. In summer it takes usually twelve to fifteen days for indigo blue, and twenty-five to thirty for turkey red; in winter about double this time is necessary. Considerable practice is required in noting the first change which takes place in the color, and it is only after repeated trials that one becomes expert in distinguishing the characteristic changes which take place with the different colors. Thus the fading indigo blue retains its original dull tone, whereas the bright methylene blue becomes duller than paler. The fading action is, therefore, more discernible in the latter than in the former, and readily gives one the opinion that indigo blue is faster to light than methylene blue.

Fastness to Washing.

Probably the most important, at all events of paramount importance, is fastness to washing. How often is a muslin or gingham condemned after it has made its reappearance from the laundry? No longer to be recognized as it once was, the joy of its wearer, though the salesman assured the fair purchaser that it would wash. To meet this requirement the color must withstand both a mechanical friction as well as the action of an alkaline solution under various high temperatures. Under these conditions the color may not even change its tone, but may bleed and stain other colors woven or printed alongside, especially in the case of white. Such a color alongside would not be considered fast to washing.

Absolute fastness is only shown approximately by a few dyestuffs, such, for example, as aniline black by the oxidation process. Any deleterious action in washing is due to the free alkali in the soaps used. Neutral soaps, even the ordinary tallow soap itself, are not generally of much danger, but often the common household laundry soap is a yellow variety (itself a fast color), containing

in a large measure free alkali. Ultimately the last portions of the mordant are destroyed, which is the means of binding together fibre and color, thus freeing the fibre of its color. Therefore stronger mordants should be used so that the free alkali present shall have a superfluity of mordant to counteract it, and also such dyestuffs should be chosen, the lakes of which have a greater resistance towards alkalies, as New Blue (Cassella), Indophenin (Baeyer), Catechu, etc.

Bleeding.

The bleeding of self-dyed goods, even if the color is not changed, may not be harmful nor displeasing, but it is especially detrimental on mixed fabrics or those containing white. In this case, the active destructive principle is the temperature of the wash-waters. For instance, colors dyed with saffranine will turn bluer and bleed into white in distilled water at 75 degrees C., and still more decidedly at the same temperature in a weak soap solution; but the same color in a much stronger soap solution will not bleed in a temperature of only 30 degrees C. In a similar manner many other coal-tar dyes are affected. It goes, therefore, without saying that the bleeding in most cases may be prevented by using a wash-water not warmer than 35—35 degrees C. As a matter of fact, household washing of colored goods is done at a much lower temperature than white goods; and so unreliable is guessing at the proper temperature without the use of a thermometer that too great emphasis cannot be laid upon the advisability of casting aside such dyestuffs for use in dyeing vari-colored effects, whose lakes bleed easily under these conditions.

Natural and mineral dyes never bleed, also several aniline dyes, especially when dyed in full tones. Decidedly unacceptable in this case are most benzidine dyes, with the exception of the diazotised diamine colors. Most benzidine dyes bleed even in light shades, in weak alkaline solutions only slightly warmed, and repeated washing in water does not seem to eradicate this fault. White and other colors woven together take up speedily the color as it bleeds off. However, benzidine dyes show a characteristic fastness in another direction possessed by no other dyes, turkey red not excepted, in that after repeated washing and bleeding the brightness and depth of the shades seem hardly to be impaired. For self-colored wash-goods these dyes are very advantageous, also for fancy goods where the other dyed fibre is wool, as by severe washing the wool does not take up the color that bleeds off the cotton.

Rubbing and Perspiration.

As regards fastness to fulling, an article such as this would be of very little moment, as the cotton fibre does not lend itself to this process, and would only be required to resist this influence where it is used as an effect thread in woolen goods. Therefore we will pass over to the more important demands of the trade—fastness against rubbing and perspiration. This requirement is of utmost importance in the production of hosiery and knit-goods, yarns, and corset coverings and linings, and should be taken seriously into account for goods used by the making-up trade in the manufacture of underskirts. The color should not rub off nor soil light-colored or white underwear, nor come off on the hands or gloves of the wearer. As a remedy, precautionary methods are taken, partly by means of the addition of a sizing material to the dye-bath or printing paste which is dried upon the fibre, and in a mechanical manner causes any loose color to adhere to the fabric, in part by a final passage through a tannin bath, whereby the dye forming the color lake in the under layers of the fibre is fixed in a chemical manner, and also by soaping the goods after washing, and in this way removing any loose or uncombined dye from the face of the material. Still any or all of these operations do not always give satisfactory results; the color will rub in spite of all, the color-lake has not penetrated the fibre sufficiently deep and has only fixed itself mostly upon the surface. The cause of the rubbing, therefore, is not on account of the dyeing process, but in the behaviour of the dyestuff to the fibre.

Cotton possesses divers attractions for the absorption of lakes, and only such dyes for which the fibre has an attraction will produce results fast enough for rubbing. Indigo, for instance, which is squeezed from the fibre, and on that account always rubs, is exactly different from the benzidines which will not rub of themselves. Further, such colors as methyl violet, magenta and saffranine rub badly, whereas Saffranin S, Methylene Blue, Methylene Violet (Hoechst), New Blue (Cassella), Indophenin (Baeyer), and such like are satisfactory towards rubbing. The proof consists in rubbing with the hand on white paper not too smooth, or, better still, with an unsized cotton rag.

Fastness to perspiration is often demanded besides fastness to rubbing, more especially with goods that come in contact with the skin and absorb, or take up, the secretions thereof. Perspiration is composed almost wholly of water and traces of several acids, such as butyric, acetic and formic, and also phosphoric acid salts. The action of these bodies is exerted through the influence of the heat of the body and friction, and, above all, none the less aggravated by the concentration on the fibre of the perspiration with all its ingredients, through the continual drying out of the perspiration, which in time becomes even detrimental to the fibre itself. The best test is to wear under the arm or sole of the foot the sample to be tried, or, for a laboratory trial make a weak acetic bath with distilled water and acetic acid of 30 per cent., heat to about 37 degrees C., the approximate temperature of the body, dip the sample therein and rub it with the hands for a minute or two, then, without washing, allow to dry at the ordinary temperature, and also between two pieces of parchment at 25 to 30 degrees C. This is repeated several times, and the more often it is done the nearer to nature does it come.

Bleaching.

Another requisite demand for color fastness in cotton goods is towards chlorine or bleaching. This is necessary where the goods are to be bleached for the purpose of bringing out undyed parts of the fabric in a cleaner white. The operations, as are well known, are boiling under pressure, after treatment with chloride of lime, muriatic acid and soap. The boiling in water for such colors as are not destroyed in hot water, or for which the fibre has more or less attraction, is not detrimental, in fact, is rather advantageous, because the steaming tends to complete the combination between fibre and color.

Chloride of lime is very energetic in its destructive action on both natural and artificial dyestuffs alike, while dilute muriatic acid is of very little account in attacking colors which are fast to chemicking. It, on the contrary, is more energetic in its action on colors destroyed by

bleaching, causing them to entirely disappear. The only influence of soap is, practically, in rendering the fibre more pliant and agreeable in handling. Colors fast to chloring are the colors produced by the oxide of iron, red liquor, and the like, in combination with alizarin.

To test colors for their fastness towards bleaching, it is best to boil, first, as many vat blues and turkey reds are topped with direct dyes. If bleeding takes place it proves the presence of benzidine dyes. Afterwards place the sample to be tested in a cold, clear solution of chloride of lime, about two degrees Beaumé, for one to one and a half hours, wash well, and pass through a weak sour, wash again and dry. Any color standing this treatment may safely be used for fancy woven effects which require bleaching afterwards.

The fastness to acids and sulphuring is, also, like fastness to milling, rarely demanded of the cotton goods dyer. It is more essential when turkey red or indigo blue is used for a fine cotton thread effect in all-wool goods with cream or white grounds that require a final sulphur bleach. So the general cotton dyer need not apply himself to this, unless he is producing goods afterwards to be handled by the rubber manufacturer.

Selection of Dyes.

It goes, therefore, without saying that the selection of dyes is of the utmost importance, and that too much time and attention cannot be bestowed upon such an important choice. As a basis for a comprehensive plan to meet the demands of most cases the following tables will be found useful. It is known that fastness to washing is seldom found in combination with equal fastness to light and rubbing, so that the most important points should be taken into account first:

1. The demand of color fastness for hosiery and knit goods—(a) fastness to rubbing; (b) fastness to washing; (c) fastness to light.

2. The demands for yarns for wash goods—(a) fastness to washing; (b) fastness to light; (c) fastness to rubbing.

3. The demands for yarns for wearing apparel not requiring to be washed—(a) fastness to light; (b) fastness to rubbing; (c) fastness to washing (in so far as to withstand the finishing process).

4. The demands for curtains, covers, carpets, fringes, etc.—(a) fastness to light; (b) fastness to rubbing.

THE LABORATORY AND THE DYEHOUSE.

Dr. Ellwood Hendrick, of the Laboratory of Arthur D. Little, Inc., Cambridge, Mass., recently wrote a short article on the "Laboratory and the Dyehouse," which appeared in "Textile Colorist." We quote in part from Dr. Hendrick's article:

The dyehouse is also a laboratory, doing on a large scale what is done elsewhere in apparatus of glass on a small scale. Because of overhead charges, the volumes of material required, and the expense of the time factor, experiments are costly in the dyehouse, whereas they are cheap in the laboratory proper. What the laboratory adds, therefore, is the avoidance of useless experiment, the enlargement of scope and information of what is going on.

A room with laboratory equipment and furnishings and a chemist in it does not always provide these things. There are many hindrances possible. The chemist himself may be short of information or short of imagination, or the chief dyer may have no faith in him and thus not work with him, or the problem may be one of research, which can best be handled in a research laboratory. Many a good analytical chemist is helpless in research, in finding the cause of trouble, or in devising method to do new or unfamiliar things. And many a brilliant research chemist grows stale if committed to continuously work at analysis.

In a dyehouse, of course, the first thing to know about is the water: what it contains, how to soften it, and how to treat the salts that are in solution in it. As in other industries, of course, a proper control of fuel and lubricants is desirable, but soon we come to more specific and more important problems. There is, for instance, the matter of soaps. It is not only profitable but often necessary to know the alkali content, both free and combined, and the free and combined fats and oils. Free alkali spoils wool, and free oils may prevent the dye from attaching itself to the fibre. It is also well to know how much water the soap contains. More than enough water is the cheapest thing there is to put into soap, and we buy it by the pound. Then, in the long run, the question of soap filler counts. We have found in the laboratory at Cambridge as high as 12 per cent. of sodium silicate or waterglass filler. Now waterglass is a useful article, but it makes expensive soap.

Bleaching needs chemical control, and will continue to need it until somebody with imagination gives us another bleach in the place of chlorine—a bleach with less teeth in it. The available chlorine in bleaching powder must be determined, and bleaching powder, it must be remembered, even like the good little girl in the Sunday school book, changes with time. It does not, like whiskey in a stoppered bottle, "cease to age." Then, too, the strength of the anti-chlor must also be determined, for chemistry is not lopsided in the way it works. Both sides of the equation must be known.

Mordants must also be tested and determined—and by determined we mean selected as well as known. For instance, if a dyer is working with logwood, and the logwood is old, it may be in part oxidized, and then it is unwise to use an oxidized mordant to develop it properly. We can have too much of a good thing.

As everybody knows, one of the things achieved in scouring wool is the extraction of the grease, which, if not removed, will prevent proper dyeing. And again, the wool must later be treated with oil in order to spin it. Here the textile chemist is needed to select the proper oil to do the work well, and then to come out in the final scouring.

In dyeing silks with acid dyes, sulphuric acid will give the brightest shades, but it lacks deliberation and is likely to cause unevenness. Even the milder acetic acid sometimes forces the color on too fast, and it is desirable to add acetates or acetic acid salts, which break up gradually in the bath, and fix the color in slow and even measure. Again, it is occasionally better to dye without an acid, which is added later in small amounts at a time. We are dealing here with colloid chemistry, and in colloid chemistry it makes a great difference just how and just when you do things. This particular division of physical science might well be called "Just So Chemistry." If dyes are bought in the open market it is still necessary to test them for strength and shade.

Finishing Materials and Their Identification

By ALFRED BURTON, Hon. Secretary, Can. Section, Society of Chemical Industry

THE impregnation of cotton with finishing materials occupies a most important branch of the finishing of cotton fabrics and yarns, but before going into the details of the art a reasonable knowledge of these materials is a most advantageous, nay, even a requisite, grounding for obtaining a clear insight and understanding of this important practice of the cotton finisher.

These materials may be defined as organic and inorganic substances, either forming the body of the finish and building up the handle of the goods or as additions to the finish to produce some particular quality as it may be required to be imparted thereby.

They may suitably be divided into two classes: those which upon boiling with water form a paste which dresses the outside of the fibre, and those which with water form a viscous solution, which wholly or in part may impregnate the fibre itself. This general classification does not, however, exhaust their number, there being those that are insoluble in water, but are used as additions to the two above classified combinations for the purpose of imparting some essential requirement: such as to render the goods softer and more pliable; to give a greater or lesser lustre, for the purpose of adding weight to the fabric or yarn; or for the prevention of mildew and inflammability; while lastly there comes into consideration the addition of dyestuffs and pigments to maintain the original color.

The most important group is the first one, containing the substances forming pastes of which the different varieties of starches play their individually characteristic roles. They are obtained in large measure from the vegetable kingdom, chiefly from seeds and tubers, also in the organs of plants containing the seeds of germination. The number of starches is therefore very great, nevertheless, on the other hand, only a comparatively few find universal application. The principal ones of the group are wheat, potato, maize and rice starches.

The starches of commerce are either tasteless, odorless powders, or irregular, white, easily breakable pieces, insoluble in cold water, alcohol and ether, but swell up in warm water, forming a paste. The temperature at which swelling occurs varies with the different starches, e.g., potato starch at 115 degrees F., and sago at about 150 degrees F. A continuation of the heating causes the starch granules to split up and form with water from a clear to a turbid mass, likened in some respects to a solution more generally described as a paste. The different starches behave in this respect by no means alike, showing the greatest diverseness in their solubility in hot water. Of the best-known starches potato starch is the most readily soluble, and the resultant paste is nearly transparent. The paste-forming and thickening power is in inverse relation to the solubility, the readily soluble potato starch thickening the least, and maize starch the most; thus maize starch produces the stiffest result as an ingredient in the finishing size and potato starch the softest.

A good starch that is a requisite for finishing purposes should be as free as possible from gluten. Most flours contain besides starch also from six to ten per cent. of gluten, the presence of which cause the flours to give with hot water a paste quite different in its properties from that obtained with the corresponding starches, e.g., wheat and rice flour give a paste much stiffer and ropy, also more readily decomposed and more prone to turn mouldy than the same starches. Both theory and practice have recorded the property of a paste made from potato starch to attract moisture in a comparatively short time after cooling causing a loss in adhesive quality, the cheaper potato starches being therefore suitable for combination with wheat starches, producing under heat a thin flowing paste, which on cooling becomes quite firm and will withstand the action of dilute acids for a considerable time. Rice and maize starch give a clear thin paste, which on cooling becomes gradually thicker and imparts a stiff finish practically like unto wheat and potato starches.

The different flours are, nevertheless, largely employed not very generally for piece goods, but, on the other hand, very frequently for yarns, especially when it is desired to obtain a full handle and add weightening materials. The adhesive properties of the flour serve to bind the mineral weightening substances better with the thickening materials on the one hand and with the fibre on the other. By such means an eight-ounce fabric may be guaranteed to contain only four ounces of cotton.

Starches may also be made into pastes in conjunction with soda lye and at the usual temperatures, and may thus be used as a groundwork, along with other finishing materials, to produce a paste which will neither turn sour nor promote mould, and will give as stiff a finish as can be produced with starch pastes. Arrowroot, sago and tapioca starches are also met with in commerce.

The second group comprises the mucilaginous substances, of which the best known is gum arabic, though of very limited usefulness. The by far most important bodies of this group are those starches obtained by the process of roasting, such as dextrine, the most important member, the operation being carried out at varying temperatures from 210 degrees to 280 degrees C. Dextrine comes on the market in various degrees of color from a cream to a dark brown. It is readily soluble in water, giving a syrupy solution of similar color to the quality used, the darker ones, of course, being only useful for dark colors. The lightest in color is obtained from potato starch. British gum is made from rice or maize starch and is of a gold-brown color, and the darkest in color is from wheat starch.

There are also the so-called soluble starches, or dextrines, made by using weak solutions of the mineral acids during the warming of the starches. The next most important members of this group are the glues and gelatines, both well-known products, which, in accordance with their physical characteristics, give to the goods a certain body, and in relation to their strength a greater or a lesser degree of stiffness. They are of animal origin, nitrogenous, and therefore, like the glutens, inclined to promote mould, and as some grades of glue nave not an altogether pleasant odor, care must needs be exercised in their employment as additions to the size. Other members are Tragacanth, flax-seed, Iceland moss, Caragheen and similar plants, forming with water a gelatinous mass, which are useful additions for softening the finish. Other substances used largely for the purpose of softening are

soaps, fats, olive oil, castor oil, turkey red oil or sulphated oil, paraffins and glycerine. These substances are not used alone, but merely as additions, and it is customary to use a certain amount of chalk or magnesia at the same time that these additions are made. Turkey red oil and glycerine should only be added in very small proportions, owing especially to the hygroscopic nature of the latter, and over additions would impart a clammy feel to the fabric, which would be most undesirable.

For the imparting of glaze or lustre, such substances as the waxes are brought into play, generally applied in conjunction with soap or other materials of a softening nature, especially if the goods are ultimately to be lustred or glazed by means of the calendar. Occasionally borax is made use of for the same purpose. To obtain weight and fulness, resort is had to such materials as addition agents, as china clay, talc, kaolin, chalk, barytes, magnesium chloride and epsom salt.

To prevent mildew the following substances are useful: salicylic acid, boracic acid, phenol, and zinc chlorides and sulphates, which latter at the same time add weight.

Occasionally certain dyes and pigments are made use of to maintain the tone and depth of dyed cloths and prevent a lightening of the color which a heavy colorless size would be inclined to impart, the most important being logwood, turmeric, and ultramarine.

Having now completed a general survey of the materials used and noted their chief characteristics, the examination of finished cloths for the purpose of identifying the materials incorporated in the fabric may be taken up, which from a strict chemical standpoint presents to the finisher a more or less difficult problem. It is here that the experienced man is of good avail; he will be able to detect if the goods have been stiffened or not; he will further be able to distinguish between goods that have been filled or dressed only on the back; or if the goods have been calendered, mangled or beetled. Having decided these points, a decision is arrived at as to the class of ingredients likely to be found present. By rubbing between the fingers or tearing the cloth rather sharply, it is possible to tell if the fabric has been weighted by mineral substances by the production of considerable dust. The water content may be arrived at by cutting a small piece off the goods in question, of determined dimensions and weight, weighing and drying in the usual dry chamber until the weight becomes constant. The difference in weight is the water content. The knowledge of the amount of water present is only comparatively useful. It gives, however, some idea of the composition of the size, especially as to the starch, which is very hygroscopic, even like the fibre itself.

To determine the amount of dressing present, weigh first a piece of the material of similar dimensions to that taken to determine the water content, rub it well between the fingers, beat it, or brush it out well, wash in warm distilled water, and dry again until the weight becomes once more constant. The loss in weight represents together the incorporated materials and the moisture. The difference between the total loss and the water content, already obtained by the first test, gives the weight of sizing ingredients employed. To determine approximately the weight of starch present, take a third piece of material of like dimensions to the two previous ones and treat at a temperature of 30 to 40 degrees C. in a diastofor solution for some time, wash in distilled water, and weigh as before. Mineral colors, china clay and insoluble soaps are not removed by this means.

For the determination of the soluble ingredients the solution obtained by boiling in distilled water must be further examined. This solution will contain any starch, dextrine, glue, soluble gums and soluble salts, also mineral color, if any, in suspension. Filter the solution and concentrate a small portion by evaporation. A small drop of iodine solution will give a blue coloration if starch is present; should there be no color reaction, continue the evaporation to further concentration, and add two or three times its volume of alcohol and dissolve in hot distilled water. From this solution the presence of glues and gelatines may be detected by precipitation upon the addition of a tannin solution, while on the other hand, gums and dextrines are not. To distinguish between gums and dextrines, recourse is had to the polariscope. Dextrines turn the plane of polarized light to the right and gums to the left. If both are present, test with basic acetate of lead, which at low temperatures separates out gums. If there is no precipitate evaporate down to dryness in a platinum crucible. A black charred residue denotes the presence of a derivative of some plant. Sugar may be detected by the usual Fehling's solution. For the determination of the presence of the soluble salts in the filtrate of the distilled water solution, follow the usual procedure for qualitative analysis. What is left behind on the filter is usually china clay or sometimes talc. The presence of fats is determined by saponification in a boiling soda solution. The solution is filtered, and acidified, the wax soaps precipitate, and the fatty soaps and acids rise to the surface. From this examination the practical finisher will have a very good idea of the composition of the finish and be able intelligently to prepare a mixture somewhat similar, the same old rule holding good in this case, that practice makes perfect.

CANADIAN CIVIL SERVICE SCIENTIFIC MEN FORM ORGANIZATION.

In order to assist the Government and the Civil Service Commission in their di..cult task of classifying and readjusting the salaries of its scientific and technical officers and in applying that classification, these officers, following the example of the professional officers in the British Civil Service, have organized as a result of several meetings of representatives of the different engineering, scientific and technological divisions of the service, and have formed an "institution of Professional Civil Servants." It is intended that this organization shall afford a means of communication between the Government and the Civil Service Commission on the one hand and the scientific and technical officers of the Civil Service on the other, and that it shall consider and deal with all matters affecting the welfare and work of that important section of the Government service. The governing body of the association will be composed of representatives elected by the various groups of scientific and technical men, anf the Provisional Council consists of representatives of the engineers, chemists, geologists, agriculturists, foresters, surveyors, biologists, astronomers, veterinarians, etc.

FAST COLORS FOR CARPETS.

As many as 100 different shades are woven into one Axminster carpet, which would seem to indicate that fast, bright colored dyestuffs are essential in the carpet trade.

The Modern Silk Dyehouse

By LOUIS J. MATOS*

THE modern silk dyehouse as an adjunct to the mill is a department which must be laid out with the greatest care and consideration. This is particularly the case at the present time, for the reason that competition in silk manufacturing and dyeing has become keener during the last decade. Formerly that part of the mill or yard set apart as a suitable place for conducting the dyeing operation, whether for skein yarn or piece goods, was usually a region that was ill-adapted to anything else and for that reason, if for no other, was deemed most suitable to carry on the wet operations of silk manufacturing.

At one time, and particularly during the old period of dyeing when the natural dye wares occupied a position of great prominence, much of the equipment was of wood, but as the methods became more revised and the demand of customers more exacting, especially as to the condition of skein when delivered, compelled the dyers to expend more money for equipment and consequently great impetus was given to the manufacture of copper dye kettles and fittings, and it is now seldom one sees anything but tubs and pots and other paraphernalia except such as is made of this metal. Although copper ware is costly, even under normal conditions, it is the cheapest metal in the end to employ for the handling of silk and has advantages over every other material for the same purpose, that are beyond comparison.

Perhaps the greatest amount of silk is handled in the form of skein yarn, and in order to handle this most economically and efficiently, requires that the dyehouse should be furnished with an abundant supply of pure soft water; softer the better, even if it becomes necessary to go to the expense of installing a modern water softening plant. Indeed, this latter installation will be found to be good insurance in case there is any doubt as to the quality of the water that must be used. Even slight changes in the quality of the water which may be due to very remote causes are likely to so influence the quality of the dyed and finished silks coming from that particular dyehouse, as to materially influence their value upon the market. The influence of good soft water is nowhere better seen than in boiling-off, which operation, although apparently simple, is one of the greatest importance and requires careful oversight lest through accident, defective results are obtained.

To be considered with the water supply for the preliminary treatment of silk, should also be considered the soap necessary to dissolve the sericin; the purer and more carefully made soaps are the cheapest in the end. A soap made of pure olive oil should be given the preference to that made from any other substance and while there are differences in the appearance of olive oil soaps of different manufacture, yet it will be easy for the boiler of silk to make the proper selection. Cents per pound should play less importance than the assurance that the soap is made from a straight olive oil; let the cost per pound be what it may.

To boil off silk requires about 3 lbs. of soap for each 10 lbs. of skein silk in three gallons of water. These quantities may vary slightly, but for effective work and good results, they will not vary very much. The silk is immersed for about an hour at a temperature ranging from 195° F. to 205° F. and during the immersion the silk should be regularly turned in order that every portion of it may be brought in free contact with the circulating soap solution. Should it be desired to dye the silk very light shades, it might be advantageous to pass the skeins through two soap baths; the first containing about 2 lbs. of soap for each 10 lbs. of silk and the second about 1½ lbs. of soap for a like amount. Work in each bath under the same conditions as previously outlined. Should the silk be treated in this manner, the second soap bath should be used for the first treatment of the succeeding batch; adding about one pound of soap for each 10 lbs. of silk.

Perhaps in no other operation will the quality of the water manifest itself than in the stripping or boiling-off, for should lime or magnesia be present in the water, undissolved lime soap will form as a deposit that cannot be removed by any practical means.

Should it be desired to boil off or strip the silk down to the net fibre, it will be necessary to put the silk in vats containing from 10 to 15% soap on the weight of the silk and keeping them heated for two or three hours at the boil. By this treatment the last traces of sericin are completely removed from the fibre and nothing remains but the clean silk. To do this properly requires that the silk skeins should be hung in a boiling soap liquor while packed in loosely woven bags, which will prevent the skeins from tangling or becoming matted. Stripping and boiling-off is an art and requires considerable experience and close observation to know when the batches of silk are uniformly treated. Even skillful dyers are sometimes confused about the appearance of the silk, since there is no means of testing to determine when the boiling-off has been carried to the utmost.

Regarding weighting. This subject has been treated so often that it seems unnecessary to allude to it, but in order to have the present article as complete as it should be, reference to this important process of treating silk cannot be well omitted. It is not proposed to discuss the merits of silk weighting. It is a custom that has grown up through years and will probably always remain. That it has served a purpose in some instances cannot be denied. The most important point to keep in mind when weighting or dynamiting silk, is the cleanness of the silk. To attempt successful weighting with tin upon a good grade of silk that has not been thoroughly boiled off, is but a waste of time. Stripping should be so complete that no grease or fatty acid of any kind remains on the fibre, since these will be converted into metallic soaps by the tin used and which in turn will cause the development of tender spots and uneven dyeing. Washing of boiled-off silk preparatory to tin weighting should be so effected that no alkali remains, since traces of soda in the silk will combine with the muriatic acid of the tin, forming sodium chloride, which it is positively detrmental to silk. It is for this reason that soaps used in stripping or boiling-off should be as nearly neutral as possible and should not contain more than a half per cent. of free caustic alkali determined by careful analysis. Guesswork in making this analysis will not suffice. The attempt to use alkali to correct the hardness of water is likewise detrimental to the silk fibre for the above reason.

While the details of the dynamiting process will not be given, since they are well known, it might be well to draw attention to the fact that the dynamite bath should be lead-lined and jacketed so as to permit the circulation of cold water: that the temperature of the bath may be kept at 60° F. Should it become necessary to lower the temperature

*From "The Silk Guide."

of the bath in hot weather, ice should be added directly to the dynamite. Should the lead lining of the dynamite bath show at any time a white incrustation,—while this latter is not injurious,—yet it should be removed from time to time and not allowed to accumulate. A clean lead bath is one of the guarantees to clean finished silk.

Controlling the strength of the dynamite bath is likewise important. A hydrometer should be used and the strength kept at 54° Tw. (about 30° Bé). Should the bath become diluted after the addition of ice in summer time, it should be fortified and brought up to the proper strength by the addition of a strong solution of dry stannic chloride.

One point to guard against is to be careful about using a bath that has become cloudy and when this is noticed it points to the possibility of imperfect whizzing from the phosphate. All dynamite baths should be strained so as to remove all floating particles, loose fibre, pieces of wood or other chemical substances that are likely to injure the fibre.

The phosphate of soda bath requires no special mention since the material of which it is made is reasonably cheap. Its strength should be controlled with a hydrometer as for the previous bath. It should stand at about 9°-11° Tw. and from time to time should be strained so as to keep it clean and free from specks and other foreign matters. The silicate of soda bath requires rather close attention and the working condition depends upon whether the silk passing through it is being heavily or light weighted. If of light weight, it may be used as many as five or six times, but if heavily weighted silks are passing through it, the silicate bath should not be used more than three times. Watch out for cloudy batches and when this occurs, there is only one remedy and that is to pull the plug and let the liquor run off. Where such a bath is used the silk will invariably be chalky, and when dried a fine white powder will dust out. It is, therefore, poor economy to retain a bath that has "broken," due to the excessive number of silk passes. In this connection it might be observed that chalky silk cannot be rectified. No remedy exists that will overcome the chalk forming upon silk due to an over-loaded silicate bath. Owing to the comparatively low cost of silicate of soda, no advantage will accrue to working it beyond its possibilities. Indeed, a permanent white on silk passing through such a silicate bath will not be obtained.

The use of sulphate of alumina as a "swelling" agent after weighting is occasionally resorted to for certain kinds of silk goods. This bath should stand at about 15° Tw. and heated to about 125° F. When in proper working condition it should be perfectly clear and of a peculiar pale bluish tint. Should it appear clouded or of a slight brownish tinge it should be regarded with suspicion.

Of course, washing between the various baths is necessary, and it will be found poor economy to stint the water; indeed, the silk weighting department requires a very large amount of water in proportion to that amount required in other departments of the wet end of silk manufacturing, and in this department the water should be as pure as that used in the boiling-off operation. A well appointed dyehouse having a weighting department should be so laid out that both branches are separate. Owing to the character of the work done in the weighting there is little in common between it and the other departments. Therefore, it should be regarded as a distinct branch.

The dyehouse proper for skein silk does not require particular mention other than that all the kettles should be copper. They should be kept thoroughly cleaned and ready for instant use for any shade desired. An exception, however, may be made where black silks are one of the standards of the dyehouse, and where large quantities of black are turned out it might be well to set off a portion of the dyehouse for this shade and no others. Fancies and mode shades, of course, can be dyed anywhere and any form of kettle can be made use of as the orders come in.

One of the most important parts of a mill having a dyehouse is the drug room, that portion of the plant set apart for the storage, weighing-out and mixing of the various mordants, chemicals and dyestuffs used by the dyer. There is no question but that the drug room proper has been one of the least considered sections of a mill, but owing to the nature of the work done in it, it should be given first consideration, for, as a rule, it serves, not only as a store room for the smaller dye packages, but as a laboratory and office for the head dyer and his assistants. It should be well lighted. It should be provided with ample table accommodation; with suitable scales; a sink or wash trough of sufficient size in which scoops and pails can be comfortably washed and dried. It should be provided with a window facing the north, in front of which should be placed a large wide shelf covered with black broadcloth which serves as a proper background for the matching of shades.

The piece-goods dyehouse, in the main, does not differ materially from that of the skein-yarn dyehouse, except that the machinery is of an entirely different type. The principle of the piece-goods dyehouse is to keep the fabrics full width during the time that they are immersed in the dye liquor, and this means that each dye kettle should be of large size, made of wood and copper lined, and provided with a rotating winch, generally operated by hand, and over which the pieces pass full width during the dyeing. Certain classes of silk piece goods may be dyed on jigs, which are constructed somewhat lighter than the jigs used for cotton piece-goods dyeing, but the principle is identically the same. Some classes of cotton and sik mixed goods, which are always handled in silk dyehouses—especially those very beautiful brocade effects in black and white or in other colors where the cotton is dyed with sulphur colors in the presence of glue or glucose leaving the silk undyed, may be conveniently dyed in jigs. Indeed, it is desirable that they should be so dyed, for the reason that cotton requires a rather concentrated bath to obtain that degree of fullness, so much desired for this class of fabrics. In some dyehouses where these goods are dyed, the cross-dyeing of the silk with acid colors is done in the open winch machines in which weaker solutions are, of necessity, employed.

Recipes for dyeing some of the brocade-effect silk goods at this time are not necessary, since hardly two silk mills are operating upon identically the same lines and owing to the peculiar conditions existing in the dyestuff business to-day, continued uniform supplies of colors are problematical and frequently a dyer must work out almost from week to week the combinations that he will require for the orders in hand or anticipated. It might be said, however, that during the past three years the silk dyer has had many trials to overcome and has been compelled to resort to expediencies of a nature that it was hard to believe could be overcome, but he has arisen to the emergency and has made the best use of the supplies at hand, with the result that the silk consuming public has had few grounds for complaint, for the quality of the output of the American silk dyehouse during the past thirty months has been equal in every particular to the period prior to the war.

NICKEL COINAGE*

A Comparison of Nickel with Other Metals for Coinage—Advantages of Nickel Coinage.

By C. E. MacDONALD

THE advisability of introducing nickel coinage in Canada has received considerable attention in the press during the past year. This has, no doubt, been occasioned by the soaring price of silver and consequent danger to our present coinage—if fifty-cent pieces become worth fifty-five cents as bullion, they are soon apt to disappear from circulation.

The press articles, however, have been fragmentary, and, for the most part, based on the sentimental idea that, as Canada produces upwards of eighty per cent. of the world's nickel, we should use this metal for our coins of low denomination.

This article has been prepared to present the various phases of the question in a brief but consolidated form, and to point out the entire suitability of nickel for coinage from a physical, chemical and cost standpoint, as compared with the other possible metals.

The bibliography on the subject is scattered and indefinite, and some of the figures included may be subject to correction; but they are sufficiently accurate to present the matter in true perspective.

Historical.

The idea of using nickel for coinage is not of recent origin, as will be understood from the fact that coins of nickel date back to 235 B.C. Where the metal came from, or how it was minted, remains a question; but the coins, or tokens, were an alloy of copper and nickel, not unlike those in common use to-day.

One-cent coins of a twelve per cent. nickel alloy were issued in the United States in 1857, but withdrawn in 1864, and the first regularly issued nickel coins were the 5, 10 and 20 centime pieces of Belgium, issued in 1861.

Since that time the use of nickel-bronze or cupro-nickel for coins has increased rapidly throughout the world, until, up to the present time, over seventy countries or dependencies have adopted nickel or nickel alloy coins, and eleven of these have adopted pure nickel coins. Some few of these issues have been withdrawn; but the tendency to use this metal for coinage is growing rapidly, with a marked preference towards pure nickel rather than the alloy.

Countries Using Pure Nickel for Coins and Approximate Dates of Adoption.

1881 Switzerland.	1913 Danish West Indies (Ceded to U.S.A., March 31, 1917.)
1892 Austria-Hungary.	
1902 Italy.	
1903 France.	1914 Turkey.
1906 Serbia.	Germany.
1908 Zanzibar.	Montenegro.
1910 Mexico.	Siam.

It will be seen from the above that the tendency to adopt pure nickel for coinage is increasing.

Requirements of a Metal for Coining.

The tendency noted above is largely explained by consideration of the properties that are required of a coining metal, and a comparison of these with the properties of the possible metals.

1. **The value of the metal**, within certain limits, is a minor consideration. The upper limit is controlled by the requirement that the value of the metal content, plus the cost of manufacture, should not exceed the face value of the coin; nor should the value of the metallic content be so much less than the face value as to provide a large margin of profit on a counterfeit coin.

While we retain the gold standard the subsidiary coinage pieces are merely tokens, and, within the above limits, the face value may have no more relation to the intrinsic value than is the case with our bank notes.

2. **Stability of price** is desirable, in order that market fluctuations may not so increase the intrinsic value as to exceed the nominal value; also this factor means constant seigniorage to the Government.

3. **The essential physical properties** are that it should have, and retain, a desirable appearance, be sufficiently hard and tough to resist wear, defacement and deformation, yet malleable enough to be readily minted in the modern high-speed minting machines, and sensitive to the die. It should be difficult to counterfeit.

4. **The chemical characteristics** desirable in the metal are that it should resist oxidation and ordinary chemical corrosion, and not form poisonous salts.

Let us consider the metals or alloys in present use for coinage.

Bronze.

Copper unalloyed is much too soft, but the so-called copper or bronze coins (British standard—copper, 95%; zinc, 1%; tin, 4%) have probably the greatest circulation, but in all cases for coins of extremely low denomination. They are cheap and easy to mint; but the appearance is hardly attractive, particularly after some use. By reason of the low value of the metal and the ease with which it is worked, it would offer an admirable field for counterfeiting, if used for coins of any considerable value.

The resistance of bronze coins to abrasion and defacement is relatively high; but the following figures, taken from the "Annual Report of the Royal Mint, 1916," indicate that the withdrawals, due to wear, are considerable:

Imperial bronze coin issued, nine years (1908 to 1916, inclusive) £2,169,257
Imperial worn bronze coin withdrawn in same period ..... £ 116,567
or 5.37%.

Owing to the large increase in coin issue in this period, over previous years, a fairer indication of wear on bronze coins is given by the following:

Imperial bronze coin issued, nine years (1902 to 1910, inclusive) £1,281,427
Imperial worn bronze coin withdrawn, nine years (1908 to 1916, inclusive).. £ 116,567
or 9.09%.

Such large withdrawals of worn coin seem to indicate that this alloy is not ideal from the standpoint of resistance to abrasion.

Aluminum.

Aluminum has been used for coinage, but is entirely unsuited. Its color is good, but the low weight is a drawback rather than a good feature. In 1907 and 1908 twenty

* Paper prepared by C. E. MacDonald, Sales Engineer, International Nickel Company of Canada, Limited, for Canadian Mining Institute's annual meeting, Toronto, March 10, 1920.

million pieces of low denominations were issued in three British African Protectorates—Nigeria, British East Africa and Uganda. This coinage only survived two years, and in this short period the coins became badly corroded, and the whole issue of aluminum coins was withdrawn in 1910 and replaced with nickel-bronze.

A commission of scientists, appointed by the Minister of Finance of France, reported in 1910: "Neither pure aluminum nor any form of aluminum slightly alloyed gives a superior resistance to shocks and friction than that offered by silver, which resistance is insufficient for small coinage; moreover, none of the alloys offer resistance to the prolonged action of the usual chemical agents."

Cobalt.

Cobalt has been suggested, but the difficulty of working this metal into sheet and subsequent difficulty of minting the blanks, added to the high initial cost of the metal (about $2.50 per pound), make it hardly feasible. Cobalt alloys, too, are barred by the same features.

Nickel Alloys.

Nickel Silver (previously known as German Silver), an alloy of copper-nickel-zinc in varying proportions, and the same alloy with additions of pure silver, have been tried; but the coins oxidize readily and become yellowish and unsightly. They present less resistance to wear than bronze coins, and the low metal value makes them undesirable for coins of any appreciable value. They are not to be as well recommended as the nickel alloy following.

Nickel Alloy—an alloy of 75% copper and 25% nickel—is in general and world-wide use, and meets the requirements for subsidiary coinage more fully than any of the foregoing metals. The appearance, when new, is good; but, when worn, takes on an unattractive yellowish or greenish cast, as is evident in the United States "nickel." The hardness is sufficient to resist undue wear and defacement, yet the alloy is readily rolled and easily minted, and the cost is well within economical limits. Incidentally, the low cost and ease of working—two admirable features—presented such an opportune field for counterfeiters as to render the alloy undesirable in Italy and Korea.

Silver.

Everyone is familiar with silver coins. Their appearance is good, they are easily rolled and minted, and take the impression of the die well. The amount of wear is probably greater than generally suspected. Over a period of forty-five years (1872 to 1916, inclusive), the worn silver coin withdrawn from circulation in the United Kingdom was 30% of the issue for that period. The amount of wear indicated by this figure is low, because the withdrawals, during two years of war, were less than 25% of normal, and the annual issue increased to five or six times normal.

Silver coins do not oxidize readily, and, from a chemical standpoint, are very suitable, with one exception—their affinity for sulphur, which rapidly turns them black. This is well illustrated by the coins you carried in a pocket with matches, and the frequent silver cleaning required in your home. But this is a minor consideration. The excessive wear is more serious, and the most serious drawback is the price, which will be discussed later.

Nickel.

Nickel meets all of the requirements for coinage more nearly than any other metal.

Consider:

The Appearance—Bright, white, metallic, retaining its high polish permanently against ordinary exposure to moisture, oxidation or ordinary gases and solutions.

Contrast the frequent silver cleaning, mentioned above, with the maintained polish and appearance of the nickel-plated parts of your telephone, auto fittings and bathroom fittings. The plating may wear off, but while the nickel is there the appearance remains—so with nickel coins, they remain clean and bright.

Hardness—after annealing—99-110 Brinnell—6-15 Shore—sufficiently hard and tough to resist wear and deformation, yet it flows readily under the die, and takes with clearness the fine reliefs and impressions common to coin designs.

The only available figures on wear on nickel coins are embodied in a report of experiments made in Switzerland, as follows:

> Equal weights of coin of many varieties were placed in a drum which was revolved for forty continuous hours. The abrasion noted was:

10-rappen piece of aluminum alloy	11.27%
1-franc piece of .835 silver, .165 copper	7.79%
2-franc piece of .835 silver, .165 copper	6.62%
½-franc piece of .835 silver, .165 copper	5.77%
5-rappen piece of brass (100 rappen—1 franc)	4.01%
10-rappen piece of brass (containing 60% copper, 40% zinc)	3.69%
5-rappen piece of copper-nickel	3.29%
10-rappen piece of copper-nickel	2.45%
1-rappen piece of bronze	1.23%
2-rappen piece of bronze	1.09%
20-rappen piece of pure nickel	0.59%

These results bear out what we would expect—that nickel is the most superior from the wearing standpoint.

Other Physical Properties.—The melting-point of nickel is 1,450 degrees C., higher than that of any of the other alloys or metals considered.

It is a poor conductor of heat.

The relative heat conductivities of the metals:

Silver	1.096
Copper	0.72
Aluminum	0.35
Iron	0.17
Nickel	0.14

Nickel is magnetic below 340 degrees C. Exponents of pure nickel coinage hold this to be an advantage as an aid to detecting counterfeit coins of a cheaper alloy. On the other hand, the magnetic property might not appeal to proprietors of slot machines.

Sound and Weight.—Nickel coins have a very slight ring which is distinctly different from that of both bronze and silver coins, and their weight lies between bronze and silver coins of the same size. These two properties would aid to distinguish nickel from the other coins in use.

Chemical Properties.—Nickel is one of the most passive of metals from a chemical viewpoint. It resists oxidation indefinitely at ordinary temperatures, and is with difficulty soluble in ordinary acids and solutions. It does not form poisonous salts.

We must conclude, then, that nickel meets all the physical and chemical requirements of a metal for subsidiary coinage.

Manufacture.—The process of manufacture of nickel coin blanks is long and difficult. Powerful machines are necessary both in the hot and cold rolling process, and the scrap

returns are heavy. These factors tend to increase the cost for coins, but not to a prohibitive point, and at the same time make very remote the possibility of counterfeiting.

Price of Nickel and Silver.

Before the entry of Ontario's product into the market, nickel sold for $1.58 per pound. But the active development of our Northern properties rapidly forced it down, and in 1902 the metal was selling for 30c to 35c per pound. During the war, when metal prices were soaring to undreamed-of heights, nickel was quoted at 35c to 40c per pound, and to-day is quoted over the same range. These figures show the stability of the price of this metal.

Let us revert to silver and consider the price of that commodity. Previous to the war silver was very consistently quoted at 48c to 50c per ounce; but early in 1915 it commenced its upward flight, which almost steadily continued, until it reached a price of $1.37 per ounce, and it seems to have anchored at something about $1.30. But the silver market is in New York, and to the above prices we must add New York exchange, bringing the price of silver between $1.43 and $1.50 per ounce in Canada at present.

Silver in Canadian Coins.

The present Canadian five-cent piece weighs 18 grains, and is 925 fine, 75 alloy. Under a recent act it will, in future, be made 800 fine, 200 alloy.

This lowering of the silver content was forced by the increased price of silver. The adjustment was sufficient to prevent the immediate rapid disappearance of our coinage into the melting pot, but insufficient to entirely remove the danger or to permit much of a saving to the Government at the present prices. The table below shows the difference between the **face value** and the **cost of silver content** per million five-cent pieces for varying prices of silver and exchange:

Old Standard Fine—Silver Content, 34,687.5 Ozs.

Silver N. Y. Quot'n.	Exchange.	Price in Canada.	—Per Million Pieces— Silver Value.	Face Value.	Difference.
$ .50	Par	$ .50	$17,344	$50,000	$32,656
1.30	10%	1.430	49,603	"	397
....	15%	1.495	51,857	"	1,857

New Standard Fine—Silver Content, 30,000 Ozs.

Silver N. Y. Quot'n.	Exchange.	Price in Canada.	—Per Million Pieces— Silver Value.	Face Value.	Difference.
$1.30	Par	$1.30	$39,000	$50,000	$11,000
1.30	10%	1,430	42,900	"	7,100
....	15%	1.495	44,850	"	5,170
1.36	10%	1.496	44,880	"	5,120
....	15%	1.564	46,920	"	3,080
1.42	15%	1.633	48,990	"	1,010
1.63	Par	1.63	48,900	"	1,100
1.666	Par	1.666	50,000	"	....

If we deduct the cost of manufacture—rolling, blanking, minting and other charges—from the difference shown above, it will be seen that the seigniorage on our silver coins has almost disappeared.

Cost of Nickel Coinage.

The cost of manufacturing coins of nickel is roughly twice that of silver, due to the added difficulty of working the metal to the fine specifications required for coins. But the difference in the base price of the metals, and the increased durability of the coins, would not only offset this additional cost, but would show an annual profit to the Government that would run into hundreds of thousands of dollars.

Size.

It has been suggested that a five-cent coin of pure nickel, similar in size to the United States "nickel," should be adopted, but contended that this savours of aping our American "cousins." As regards the contention, it is the opinion of the writer that by adopting a pure nickel coin we would be going them one better, and that, by adopting also a ten-cent coin of nickel, we would be making an additional improvement.

As regards the suggestion, it should be pointed out that there is no good reason why we should not also use nickel for our ten-cent pieces, in which case it would be desirable to make the five-cent coin of a size nearly corresponding to our present ten-cent piece, and a new ten-cent coin nearly corresponding in size to the United States "nickel." Otherwise, it would be difficult later to meet a size for a nickel ten-cent piece. This arrangement is based on the assumption that our present five-cent pieces are undesirable by reason of the difficulty with which they are handled and the ease with which they are lost and misplaced.

The seigniorage resulting from the suggestion above, figured very roughly, would be considerably in excess of $500,000 per annum.

Withdrawal of Present Coins.

It might be observed that during the past ten years (1910 to 1919, inclusive) approximately forty-four and one-half million five-cent pieces have been issued in Canada, of which the silver content is 1,543,571 ounces. If all of the silver five-cent pieces were recalled, and fifty per cent. of the above amount recovered, the Mint would obtain 771,796 ounces of silver, for which it paid something less than 70c per ounce. This would be reissued in silver coins of the higher denominations, in place of new silver at $1.30 an ounce, making a net saving of approximately $463,000.

As there were about the same number of ten-cent pieces issued of twice the amount of silver content, the recall on the latter (based on the same percentage recovered, and silver prices) would net about $900,000, or a total profit on the turnover of over one and one-third million dollars.

Conclusion.

In conclusion, it is evident that, by changing to nickel coinage for our coins of low denomination we would secure a coin of highly attractive appearance, more suitable, from a physical and chemical standpoint, than of any other metal; we would get a great reduction in cost for subsequent issues, or a greatly increased seigniorage, and actually make over one million dollars profit on the change; and we would be using a metal which is typically Canadian, in that our country is favored with a bountiful supply of this metal, and produces approximately eighty-five per cent. of the world's supply.

To substitute nickel for silver, in our five and ten-cent pieces, would seem the most reasonable thing to do.

ZINC OXIDE PLANT.

The first plant in Canada for the manufacture of zinc oxide has been established at Toronto by the Watts Chemical Company, 80 Don Esplanade. Zinc scrap is used in a standard roasting process. The product has already been used by some of the rubber companies, and is said to have given good satisfaction.

KNIT GOODS INDUSTRY.

There were 108 plants in operation in Canada in 1918 on knitted goods, underwear and hosiery. These are situated by provinces as follows: Ontario, 80; Quebec, 17; British Columbia, 3; Prairie Provinces, 5; Maritime Provinces, 3. The total capital invested in the industry amounted to $31,092,866. The total cost value of materials used, such as woollen yarns, etc., was $26,527,287, while the total value of production was $45,755,129.

Canadian Mining Institute

Proceedings of 22nd Annual General Meeting---Summaries of Papers Presented.

FOR three days, March 8, 9 and 10, 1920, the King Edward Hotel, Toronto, was the scene of a most successful gathering of mining men, constituting the twenty-second annual general meeting of the Canadian Mining Institute. Both from the standpoint of attendance of members and of the excellence of the papers read, the sessions were a success, and it is safe to say that when the members had returned home the great majority of them felt assured that they had not only been instructed by the papers given, but also had broadened their views concerning their profession by their contact with men who were daily confronting problems similar to theirs.

Among those attending the convention were: H. Y. Russell, Canadian Explosives, Ltd., Montreal; J. A. Campbell, M.P., Ottawa; J. Stovel, Birmingham, Ala.; D. H. McDougall, President Nova Scotia Iron & Steel Co., New Glasgow, N.S.; Dr. Bradley Stoughton, New York City, Secretary of the American Institute of M. and M. Engineers; E. P. Matthewson, one of North America's most prominent metallurgists, New York City; Dr. H. M. Payne, President of the American Mining Congress, New York City; Major Percy Barbour, New York City; E. H. Robie, representing Engineering and Mining Journal, New York City; W. Dadson Hall, New York City; Brig.-Gen. C. H. Mitchell, Toronto; Col. J. J. Tenhale, Sherbrooke, Que.

When the convention opened Hon. Harry Mills, Minister of Mines, voiced the official welcome for the Province, and Mayor Church did so for the city of Toronto.

In his address Hon. Mr. Mills spoke of a projected reduction of license fees for prospectors from fifteen, as as present, to five dollars. He said that the Government would establish evening classes in Northern Ontario, where the prospector might be educated so that he would be able to recognize the different mineral formations.

Natural Resources Are Limited.

President D. H. McDougall, of the Institute, in his address made it clear that the time had come when one should cease referring to Canada's resources as "illimitable," "boundless" and "inexhaustible." While these adjectives might have been applicable when Canada had but a few million population, it was now time, declared the president, for Canada to pause, take stock of her resources, and "cut her cloth" accordingly. "Canada has great natural resources, but none to waste," was the warning message Mr. McDougall gave the members.

After outlining the coal, iron and wood resources of Canada, President McDougall said that Canadians were in the habit of exaggerating the value of these three basic resources, which were not as extensive by any means as those of the United States.

"Canada, however, contains almost the world's reserve of nickel, asbestos and cobalt," he stated. "These are necessary to certain large industries, and possess a strategic value in enabling us to drive a fair bargain with those nations which possess essential natural resources with which Canada is meagerly supplied."

The mineral statistics for 1919 were given for the Dominion by Mr. John McLeish; for Ontario by Mr. T. W. Gibson, Deputy Minister of Mines, and for Quebec by Mr. C. T. Denis. Mr. James McEvoy, speaking on the status of the mining engineer, said that the engineer was obtaining a much more solid standing. Mr. Gibson's paper showed that Ontario's mineral production in 1919 exceeded that of 1913 by $4,349,802. Mr. R. E. Hore, consulting geologist, believed that greater publicity should be given to mining conditions and prospects in Canada with a view to attracting the attention of American and British experts and investors.

The Iron of Michipicoten.

Mr. W. H. Collins, in an address on "The Iron Ranges of Michipicoten District, Ontario," referred to the importance of that district for mining and smelting. He outlined briefly the development of the iron industry in that section, and estimated the siderite body controlled by the Algoma Steel Corporation at from 70 to 100 million tons, as yet untouched except for diamond drilling. He spoke optimistically of the possibilities of the "New Helen" Mine.

In an address on "Molybdenite in the Ottawa Valley," Mr. M. E. Wilson said that there was enough of that ore to keep a mill with a daily output of 25 to 50 tons operating for years. He said that it might appear to some that the resources of this mineral were of small consequence, but he was of the opinion that they were most promising. It was now a question of creating a demand that would warrant development, he stated.

In presenting the report of the Committee on Education, Dr. Goodwin, chairman, of Queen's University, advocated that the good work of the past be continued on progressive, practical lines.

American Engineers' Activities.

Major E. P. Barbour, assistant secretary of the American Institute of Mining and Metallurgical Engineers, outlined to the delegates some things that the American engineers had dealt with during the year 1919. No single big construction work was undertaken or completed in the U.S.A. during 1919, stated Major Barbour, but some very vital problems were dealt with by the mining men. Due to the frequent strikes the engineers were faced with decreased output. The return of many of the former mine-workers from army service presented a problem, as a good many of the old employees would not return to the mines, largely because of the fact that they had obtained confidence in themselves while in the army to do things, and preferred to start out in some line for themselves. Nevertheless, thousands were not fitted for anything else, and the American Institute of Mining and Metallurgical Engineers succeeded in placing 20,000 American returned soldiers in positions in mining work. The Institute, Major Barbour told, had used all its influence to help along the "War Minerals Relief Bill," by which mine operators who had developed new ground at the call of the Government for certain war metals, were to be recompensed for the bad financial position many of them were left in by the termination of the war. The American Institute had opposed, said the Major, the licensing of engineers by each State, as medical men are licensed. Twelve States had adopted licensing, and such licensing had only resulted in an eternal conflict between the construction and the architectural engineer. In closing, Major Bar-

bour paid high compliment to two Canadian mining engineers for the splendid papers they had given at the last session of the American Institute—that by Mr. Corless on "Industry, Democracy and Education," and that by Mr. R. W. Inglis on "Industrial Co-operation." He believed that the new President of the American Institute, Mr. Herbert Hoover, of War Food Board fame, would be an ideal president, and one that all could not help but admire.

The International Nickel Mines.

At the Monday evening session the delegates were treated to excellent lantern views of the Creighton Mine, Sudbury, Ontario, operated by the International Nickel Company of Canada, Limited, with an address by Mr. J. C. Nicholls, superintendent of the Company's Smelting Division. The operation of this mine, where 2,800 tons of ore are extracted and hoisted to the surface daily by an army of 1,300 men, working an eight-hour shift, was intimately described by Mr. Nicholls.

Mr. Nicholls introduced his subject by showing a geological map of Sudbury nickel region. He said that the Creighton Mine was the only one being worked at present. Hoisting operations were taking place from two points: at the fourteenth level at 900 feet and at the twentieth level at 1,400 feet. Cross-section slides showed the fourteenth level, with drifts, and also a section of the ore body.

Mr. Nicholls stated that a five-ton storage battery electric locomotive was used for hauling cars on the level tracks. The coarse ore was crushed underground, he stated, because the handling of ore in its finer state permitted double hoisting speed. The speaker said that the mine was pumped by a 250-gallon pump, which lifted water 1,100 feet. The hoisting plant was one of the three largest on the continent, he stated, and hoisted 2,800 tons in eight hours with a maximum hoisting rope speed of 2,500 feet a minute.

The subterranean views of the mine shown showed the latest and most scientific equipment. Every precaution is taken to ensure the safety and comfort of the workmen. Sanitary drinking fountains and other conveniences are provided hundreds of feet beneath the earth, while overhead are waiting-rooms at the head of mine shafts, a dressing-room with hot and cold water and shower baths, a hospital modernly equipped with X-ray apparatus, surgical and clinical accessories; a club-house with recreation rooms and dancing parlor, and many other facilities.

Developing Peat at Alfred.

Mr. A. A. Cole at the same session spoke on the operations of the peat bogs at Alfred, Ontario. The Dominion Government, said Mr. Cole, was endeavoring to develop the peat industry at Alfred in order to find cheap and efficient fuel for Central Canada. Mr. Cole prophesied the success of the industry at Alfred, which was being developed by methods which had been standardized in Europe.

Operations in Silver Mine.

Mr. W. Dawson, Director of the Ontario Government's Moving Picture Bureau, showed a series of animated photographs depicting operations in the Nipissing silver mines from the time the rough ore was dug out of the earth till reduced, in a refined state, to silver bars.

Mr. R. C. Wallace, Commissioner of Northern Manitoba, was to have delivered an address on the "Mining Situation in the Middle West," but was unable to be present, causing disappointment to many who were anxious to hear him.

Coal and Fuel.

The second day's morning session was devoted to the coal and fuel situation of the Dominion. "The Coal-Mining Industry in the Province of Alberta" was the subject of a splendid paper by Mr. J. T. Stirling, and read by Mr. James McEvoy. The total coal production in Alberta in 1919 was 5,022,012 tons, a reduction of 1,126,208 tons below that of 1918, due to the three months' miners' strike. One million tons of the 1918 production was not consumed, but was carried over until 1919. There was a possible market for Alberta coal in Canada of from 7,500,000 to 8,000,000 tons per year.

The following table, taken from Mr. Stirling's paper, shows the reduction in amount of Alberta coal sold in the different Provinces during 1919 as compared with 1918:

	1918.	1919.
Sold in Alberta	3,440,154 tons	2,991,110 tons
Sold in British Columbia	101,189 "	95,461 "
Sold in Saskatchewan	1,372,439 "	1,115,329 "
Sold in Manitoba	511,168 "	314,290 "
Sold in Ontario	629 "	308 "
Sold in Nova Scotia	133,276 "	121,212 "
Total sold	5,558,855 tons	4,637,710 tons
Total produced	6,148,620 "	5,022,412 "

Coal Supply of Canada.

Mr. Stirling's paper was followed by a very excellent address on "The Coal Supply of Canada," by Mr. F. W. Gray, editor of the "Canadian Mining Journal." Canada's coal problem was an outcome of her national importance, said Mr. Gray, and was primarily associated with self-defence and national growth. The fact that we were so largely dependent on another country for our coal was something not to be desired in times of national emergency. The problem was—over what extent could the bituminous coal of Canada be distributed. So far as the country west of Fort William was concerned, the Alberta and other Western fields could take care of that, but the great industrial centre of Central Canada was dependent almost entirely on imported coal. Yet Mr. Gray believed that the coal mines of Nova Scotia, if properly developed, could cover this vital portion of Canada. What, then, had been the matter with coal production in Nova Scotia, where the development was really recessive instead of progressive? In answer Mr. Gray gave four chief reasons: (1) Lack of railway transportation; (2) The failure of Governments to realize the importance of the Nova Scotia mines and of the whole fuel problem; (3) Lack of co-operation among the coal-mining companies. In one instance Cape Breton coal sold in Montreal at $2.40 per ton, a figure that was below the cost of production, but forced by the policy for many years used by Canadian railways of screwing down Nova Scotia coal operators to a minimum selling price, American competition being skilfully used to effect this; the American coal against which the Cape Breton coal competed being itself sold at prices below the cost of mining to the American operator, a fact since proven by the statistics of the United States Fuel Administration. (4) The shortsightedness of the public and of the railways, including the Government railways.

The apathy of the public had prevented the search for newer fields. United States coal got a cheap haul to Fort

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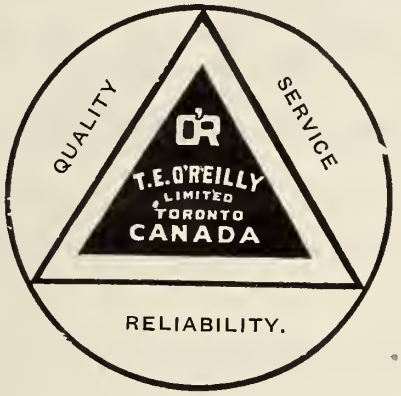

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William because the same cars could be sent back loaded with iron ore, but by deepening the St. Lawrence River a cheap haul for Canadian coal from Nova Scotia could be secured. During the war two million tons of Nova Scotia coal had been transported to Montreal in six months of open shipping by water, and Mr. Gray urged that this be got back to immediately. To put Nova Scotia coal in greater use other things were also needed—the St. Lawrence market should be developed, a uniform control of operations of companies should be established, and there must be a recognition by purchasers to purchase Canadian coal and to pay a fair price for it. As to the anthracite that was imported, Mr. Gray suggested that large storage piles should be instituted by the Government, where it might be stored, saving the usual jam and congestion at Niagara Falls and Bridgeburg. In reply to a question as to why so many coal-mining companies in Eastern Canada had failed, Mr. Gray stated that these failures were largely due to lack of co-operation among the companies.

Saskatchewan Lignite.

The lignite fields of Saskatchewan were ably described by Mr. A. McLean in an address illustrated by lantern views. This fuel of Saskatchewan was the first fuel supply met with after leaving Eastern Canada, said the speaker. It was first discovered, officially, in 1857. The largest field is situated around Estevan and Taylorton, and seams of lignite are met with 600 feet below the surface. The probable tonnage of the field is around four billion tons, not counting the deposits further away. The seams are irregular and the levels vary considerably, causing extraordinary rolls to appear, which were plainly shown on a chart shown by Mr. McLean. A feature of the Saskatchewan mines was that there is practically no inflammable gas met with in the district. The lignite production of Saskatchewan in 1919 was about 250,000 tons, and when the large supply available is considered as compared with the coal requirements of Saskatchewan, which are approximately 1,500,000 tons per year, a large market was assured, particularly were a successful briquetting industry established.

Fuel Briquetting.

"The Principles and Practice of Fuel Briquetting" was the subject of an exceedingly interesting address by Dr. Edgar Stansfield, of the Department of Mines, Ottawa. Dr. Stansfield began by declaring that no such thing as a perfect briquette had been produced yet. He predicted a successful future for the fuel-briquette business both in Canada and the United States. What was known as the carbo-coal briquette, a briquette made from bituminous coal containing a large yield of tar oils, was probably the best briquette, provided it could be produced successfully commercially; so far as laboratory tests went the carbo-coal briquette was practically an ideal one, said Dr. Stansfield. The average briquette weighed from 13 to 14 ounces, and there were presses now in operation that could turn out 30 to 40 tons of briquettes per hour. "The briquetting game is an endless mixture of small variables," said the speaker, referring to the numerous factors that enter into and influence the making of a good briquette. He described the different attempts made in the test plant at Ottawa to produce better briquettes, and it was very often a puzzling business to know, for instance, just how much water to add to the mixture. The materials used to make briquettes were several: Anthracite fines, that is, the screenings, etc., from anthracite coal; bituminous coal, though not to same extent as anthracite; lignite; coke; charcoal had also been used. For binders, asphalt and coal-tar pitch are used. Sulphite pitch was a good binder in some ways, but was not waterproof. No processes in briquette-making were standardized. In conclusion, Dr. Stansfield suggested that Nova Scotia coal might be treated by briquetting, giving a substitute for anthracite, as was done at the plant at Clinchfield, Virginia. In the United States briquetting plants are situated at shipping points where the coal is screened, and the speaker suggested that were the Canadian Government to erect storage bins for American anthracite coal, as recommended by Mr. Gray in his address, such points of storage would make excellent locations for a briquetting plant.

Transportation of Coal.

An able presentation of the transportation problem as affecting the coal trade was given by Mr. M. A. McInnis, of the Lackawana and McCrory Coal Company, Montreal. Facilities for the handling of coal coming into Canada and the future adjustment of freight rates would largely govern the distribution and the cost, he said.

"We in Canada are entirely dependent on the United States for anthracite," said Mr McInnis. "Our consumption of hard coal last year reached 4,782,000 tons. We are dependent for bituminous to the extent of 17,275,000 tons, or over one-half of our requirements. At the present rate of importation of anthracite and bituminous combined, totalling 22,000,000 tons yearly, or 60,000 tons daily, it is to be expected that from time to time we shall have to deal with abnormal conditions, and for these and the ordinary increase in population and consequent increased coal consumption, we should be prepared. The total coal consumption in Canada last year was 35,000,000 tons, or about four and a half tons per capita. When our population reaches 10,000,000—a number we may expect by 1925—our consumption will have increased by 9,000,000, making a total of 44,000,000 tons yearly. Unless our home production can be increased materially in the meantime, we will be forced to import about 27,000,000 tons yearly by 1925, or 74,000 tons daily. Of our total coal imports 42 per cent. is water-borne, 46 per cent. carried by rail, and 12 per cent. by ferries."

Mr. McInnis said that there were 123 storage plants for coal on the St. Lawrence and Great Lakes, capable of handling millions of tons a year.

"Saskatchewan, Alberta and British Columbia do not have to import fuel to any extent, the total imports from the United States being less than 25,000 tons yearly," the speaker stated. "The mine outputs of these Provinces total nearly 8,000,000 tons. British Columbia exports about a million tons of its products each year. The enormous coal resources of this trio of Provinces is estimated at about twelve hundred billion tons, and are just beginning to be realized.

"The territory at the head of the lakes, including Manitoba, imports 3,000,000 tons a year, of which 2,000,000 tons are taken by the railways. The greater part of this coal is carried by rail from the Pennsylvania mines to Buffalo and other lake ports, then by water to Fort William and Port Arthur, where the C.P.R. and C.N.R. have large storage and discharging plants. It is here loaded into cars and shipped as far west as Winnipeg and other points in Manitoba. Although this territory is about 1,500 miles

from the mines, the water haul, with its comparatively low freight rates, keeps the price of coal in Winnipeg within $1.50 a ton of the price in Ontario and Quebec.

"Our greater difficulty in importing coal by rail is at Niagara, or what is known as the Niagara gateway. The Canadian roads at this point are unable to accept freights at the rate and in the quantities that American roads are. For the greater part of the year our roads can handle but one hundred cars a day. Owing to the comparatively short haul from the Pennsylvania mines to the cities and towns of Southwestern Ontario, or the territory bounded by a line drawn from Niagara to Toronto, and west to the shores of Lake Huron, these points have depended on rail coal rather than on the development of water facilities on Lake Erie and Lake Ontario. Toronto, Hamilton and other points in this area should eventually take more coal by water, for which adequate unloading and storage facilities will have to be provided. Last year Central Ontario imported 10,000,000 tons of coal, of which the railways consumed 6,000,000 tons.

The speaker said that the Maritime Provinces had no serious difficulty in providing themselves with coal. Last year Nova Scotia, New Brunswick and Prince Edward Island imported 175,000 tons of anthracite from the United States, nearly all by water. These Provinces produce 6,000,000 tons of coal yearly.

As a means of successfully meeting the coal problem the speaker suggested: "Let the bituminous coal operator give some concessions to the early buyer as the anthracite operators do. Let the railways quote lower freight rates in summer, and the consumer will be quick to take advantage, and will provide storage room where the coal is used and where the cost of rehandling will be small. Educate coal users to buy early."

Canada's Oil Resources.

At the Tuesday afternoon session the oil resources of Canada were discussed, Dr. M. Y. Williams, of the Dominion Geological Survey, giving a splendid paper on "Future Prospects for Oil and Gas Production in Ontario," and Dr. D. B. Dowling speaking on the "Oil Possibilities in Western Canada." These addresses will be dealt with more fully in an early issue.

Tuesday evening was given over to a smoker and concert in the Pompeian Room of the King Edward, which was thoroughly enjoyed by all present.

Thursday's Sessions.

"That this meeting request the Council to look into the matter of standardization for mining machinery and apparatus and refer their recommendations to the Engineering Standards Association," was the motion unanimously passed at the Thursday morning session following an address by Dr. J. B. Porter on "Engineering Standardization." Dr. Porter outlined the work of the Engineering Standards Association, formed in 1917 with offices at Ottawa. To effect a Canadian standard or to change a standard of a certain article special committees are appointed by the Association with technical and industrial representatives. The Association does not make tests, simply makes the standards, and would therefore not interfere with the work of the proposed Bureau of Standards at Ottawa. He urged the mining men to bring forward suggestions of appliances that they wished standardized. The Standards Association would not initiate, or "butt in" on anything. They must first be asked by some responsible persons or body to make a standard, then they would gladly go ahead and make such standards as were requested. Were such things as wire nails and fasteners standardized millions of dollars of wasted money yearly would be saved. Dr. Porter thought that were such a thing as wire rope standardized it would be a decided help to the mining industry. Drill steel was another article that should be standardized—drill chucks from any maker should take steel from any maker, he said. At the conclusion of his address suggestions were asked for by Dr. Porter, and two members present asked that wire rope for deep drilling and lubricating oils be standardized. The Council of the Institute will embody these requests in their communication to the Standards Association.

Nickel Coinage.

At the concluding session on Wednesday afternoon the question of nickel coinage was taken up, and a very excellent paper was presented by Mr. C. E. MacDonald, of the International Nickel Co. of Canada, which appears in full elsewhere in this issue. Following Mr. MacDonald's paper the session unanimously carried a resolution moved by T. W. Gibson, Deputy Minister of Mines, urging the Dominion Government to adopt nickel as the metal from which Canadian coinage should be made. Dean Coleman, of Toronto University, said that he strongly supported Mr. MacDonald's contentions regarding nickel for coinage. He had advoated nickel coinage for years.

The Lost Placers.

Dean Coleman then addressed the session on the "Lost Placers of Ontario," giving a very interesting address in his usual splendid style, direct and to the point. Ontario had one of the most extensive gold regions in the world, he said, commencing at Madoc and going west for 900 miles. In the Porcupine region, which the Dean considered a very good one, there was one hundred million dollars of gold already produced, and there was probably three or twice that amount there originally. "Have we lost thousands of millions of dollars of gold by the destruction of the quartz veins in Northern Ontario, and if so, where have the lost placers gone?" asked the Dean. He personally had got gold from what was known as the Vermillion placers at Vermillion, Ont. "Are we to look on those Vermillion placers as the result of the quartz piles in the north part of the Province being destroyed?" At any rate, it was certain that hundreds of millions of dollars of gold had been lost track of in Ontario. When did the weathering begin that destroyed the quartz veins of the North? When the rivers flowed towards James Bay. There was a possibility of placers in the clay belt. There ought to be placers also in the paleogoic rocks on the Hudson Bay slopes.

Mr. T. W. Gibson asked Dean Coleman where he considered the silver placers of North Ontario could be found.

"Look below the clay," replied the Dean amid laughter.

Short addresses by Major J. G. McMillan on "Recent Developments in Mining in Northern Ontario," by Mr. J. W. Evans on "The Minerals of Eastern Ontario," and T. L. Tanton on "The Geology of Silver Islet," concluded the session. Mr. Evans' excellent paper will be abstracted in our next issue.

The following officers for the coming year were elected: President, O. E. S. Whiteside; Vice-Presidents—British Columbia, E. E. Campbell; Manitoba, W. J. Dick; Quebec, H. Y. Russel; Nova Scotia, G. D. McDougall.

Annual Dinner.

The annual dinner of the Institute, held Wednesday evening, was a brilliant success. The principal speaker

was Hon. H. Mills, Minister of Mines, who responded to the toast, "Our Mining Industry."

"The mining industry is only in its infancy, and I look forward to great developments in the future," said the Minister. There were four avenues along which he would like to see the industry advance, the Minister said, and these were more exploration, greater assistance to scientific research, more assistance to capital, and more co-operation between labor and capital. The harmonious working of labor and capital was also urged by the Minister, if the best results of the mining industry were to be obtained, as the one could not get along without the other. Thousands of miles of mine land are yet to be explored, he stated, and $10,000 had been set aside in the Government estimates this year to assist in the prospecting of this new land.

Visit to Nickel Plant.

On Thursday, March 11, ninety members of the Institute were the guests of the International Nickel Company. The Nickel Company had arranged an excursion to their refinery at Port Colborne, Ont., providing their guests with breakfast, lunch and dinner on the Pullman diner especially attached to the Grand Trunk Toronto to Buffalo express, by which the visitors journeyed.

Every part of the refinery was inspected by the mining men, and the operations fully explained by officers of the company. Major R. W. Leonard, on behalf of the members, expressed thanks to the company for their generous hospitality.

The plant of the Canadian Furnace Company at Port Colborne was also visited by the members, where they saw the tapping of a run of pig iron.

MINE OPERATORS ORGANIZE.

The mine operators of Ontario have organized into an association to be known as the Ontario Mining Association. The aims of the association are: the collecting of information and data relating to the industry, so that the people of Ontario may have a more reasonable and keener appreciation of the importance of the industry and its problems. The following are the officers and directors:

President, A. D. Miles, Toronto; 1st Vice-President, A. F. Brigham, Porcupine; 2nd Vice-President, Colonel R. W. Leonard, St. Catharines.

Directors—C. V. Corless, Sudbury; C. D. Kaeding, Porcupine; H. A. Kee, Cobalt; H. Park, Cobalt; F. L. Culver, Kirkland Lake; Mr. Cowie, Sault Ste. Marie; W. A. Carlyle, Ottawa; G. H. Gillespie, Madoc; A. J. Young, Toronto; G. C. Bateman, Toronto; J. P. Bickel, Toronto; Alex. Fasken, Toronto; B. Neilly, Secretary-Treasurer, Toronto.

DYE SECTION OF A.C.S. MEETING.

The second annual meeting of the Dye Section of the American Chemical Society will be held in St. Louis, beginning on Wednesday, April 14th. At this meeting the necessary steps leading to the permanent organization of the Dye Chemists of the United States, as the Dye Division of the American Chemical Society, will be taken.

TWO NEW COLORS ANNOUNCED.

The production of two new basic colors, known as Methyl Violet 5B, and Fuschine N.B., has been announced by the National Aniline and Chemical Co. It is stated that the good tinctorial value and good solubility of these dyes will prove very serviceable for the dyeing of leather, silk and paper, also for cotton and silk printing.

Chemical Society News

TORONTO BRANCH, SOCIETY OF CHEMICAL INDUSTRY.

There was a large attendance at the March meeting of the Toronto Branch, Society of Chemical Industry, held at the Engineers' Club, Toronto, March 19. The feature of the meeting, which no doubt was largely responsible for the large number present, was an address by one of the prominent members of the Montreal Branch, Mr. H. W. Matheson, vice-president of the Canadian Electro Products Company, Ltd.

Professor E. G. R. Ardagh, chairman of the Toronto Branch, presided, and, following the dinner, introduced Mr. Matheson. Mr. Matheson first briefly outlined the development of the different electro-chemical plants at Shawinigan, illustrating his remarks with lantern views of the plant. He referred to the advances made by the Shawinigan Water and Power Company, who first received their charter in 1898. There was around Shawinigan Falls, counting present development and possible future development, a total power resource of 1,320,000 h.p. Power was at present sent from Shawinigan by over 1,300 miles of transmission, the city of Montreal taking 60,000 h.p. The Northern Aluminum Company, established at Shawinigan in 1901, used 50,000 h.p., and produced 60 tons of aluminum per day, said Mr. Matheson. The Belgo Pulp and Paper Co. was the second industry established at Shawinigan, and is to-day turning out 165 tons of pulp per day, 90 tons of chemical pulp per day, and 90 tons of paper per day. The Canada Carbide Co., established 1903, used 40,000 h.p. and has a production of 200 tons of carbide per day. Referring to the Shawinigan Electro Metals Co., established in 1915, for the manufacture of magnesium. Mr. Matheson announced its sale to the Northern Aluminum Company. The Canadian Aloxite Company, a subsidiary of the Carborundum Company, would soon be using 20,000 h.p. They were now engaged entirely in the making of carborundum. The Canadian Ferro-Alloys Company, using 6,000 h.p., had recently added ferro-chrome as one of their products in addition to ferro-silicon. The Canadian Electrode Company, was engaged in manufacturing carbon electrodes, and had developed a splendid business. A recent industry to locate at Shawinigan Falls, was the well-known Prest-o-Lite Company, who had a very busy plant in operation. The second part of Mr. Matheson's address was taken up with a description of the process used by the Canadian Electro-Products Company in the manufacture of acetic acid and acetaldehyde. While the demand for acetic acid was, of course, not as large at present as when the war was on, yet, said Mr. Matheson, they could not keep up with the demand even to-day.

In conclusion, Mr. Matheson referred to the research work being done at the Shawinigan Laboratories, Ltd., where a process for the manufacturing of acetic anhydride was now well under way.

A vote of thanks to Mr. Matheson for his coming to Toronto and giving the address was moved by Mr. M. L. Davies, vice-president of the Standard Chemical Company, and unanimously carried.

Reports of Committees.

Prior to Mr. Matheson's address reports from committees were received. First, the report of the Executive Committee on the advisability of the Society urging Par-

liament to continue the manufacture and sale of oleomargarine in Canada was received. The Executive reported that they considered it was outside the province of the Society to deal with the question of oleomargarine, and on motion of Mr. M. L. Davies, seconded by Mr. Victor Van der Linde, the report was received and adopted. The report of the Publicity Committee was presented by Mr. L. E. Westman. This committee recommended that the activities of the Society should receive greater publicity in the daily press by suitable abstracts of papers and addresses being prepared for the press, also that arrangements be made immediately to expidate the proper measure of publicity being given in the daily press to the forthcoming convention of Canadian Chemists, Toronto, May 27-28. This committee also recommended closer cooperation between the Society and other technical bodies as well as with the business men of the city who might even be indirectly interested in chemistry, and also that the Society should arrange to hold a union meeting with the students attending chemistry courses at the University. On motion of Mr. Westman, seconded by Professor Bain, this report was received and adopted with the understanding that as regards the publicity for the convention it would practically amalgamate with the regular Press Committee already designated for that purpose.

The report of the Exhibition Committee regarding the holding of an exhibit of chemical industries at the Canadian National Exhibition, Toronto, was presented by Mr. Alfred Burton. Mr. Burton read the communication the committee had forwarded to the Exhibition Executive requesting advice, etc., as to the holding of such an exhibit, and also the reply from Mr. John G. Kent, General Manager of the Exhibition, stating that could the space be secured such an exhibit would be a timely and appropriate one. It was moved by Mr. Leonard Acton, seconded by Mr. M. L. Davies, that the Exhibition Committee continue their negotiations with the Exhibition authorities, and report again at the April meeting.

A very important resolution was then moved by Professor Bain, seconded by Mr. Perry, that the Society go on record as urging the Dominion Government to grant its full and undivided support to the passing of the Excise Free Alcohol Bill, which would shortly be before it. The resolution emphasized the great value of excise free alcohol for research and industrial purposes, and recommended that the Toronto Branch appoint a delegate to appear before officials and members at Ottawa who were dealing with the bill, as one of many other technical men who would be present to urge that the measure be passed. On motion Professor Bain was appointed as the Toronto delegate.

The April meeting of the Toronto branch will be the annual business meeting, when the election of officers for the session 1920-21 will take place.

OTTAWA BRANCH, SOCIETY OF CHEMICAL INDUSTRY.

Through the courtesy of the New Jersey Zinc Company, the members of the Ottawa branch of the Society of Chemical Industry, at the March meeting, were privileged to see thrown on the screen motion pictures depicting the manufacture of zinc oxide at the big New Jersey plant. To add to the interest of the meeting, Dr. Alfred W. G. Wilson, Chief of the Metalliferous Mines Division of the Mines Branch, gave an extraordinary talk on the process which was much appreciated by the audience. Dr. Wilson illustrated his talk with charts showing the construction of the Wetherell furnace, and also brought with him samples of the various zinc ores and products made from them. The large number present gave evidence of the fact that the motion picture meetings are appreciated by the members and their friends. As usual, the Exhibits Branch, in whose theatre the meeting was held, added to the regular programme a Canadian film, the one used at this meeting being a recent release portraying the operation of the large Government Fish Hatchery at Thurlow.

MONTREAL BRANCH, SOCIETY OF CHEMICAL INDUSTRY.

A joint meeting of the Montreal branch, Society of Chemical Industry, and the Quebec Society for the Protection of Birds was held on March 19, when a lecture, illustrated by a remarkable series of motion pictures and lantern slides, was given by Mr. Herbert K. Job, a well-known student of bird life. The branch first had dinner at the Edinburgh Cafe, after which they adjourned to the Ritz-Carlton for the lecture. The meeting was largely attended, and proved a decidedly interesting and instructive evening.

WILL VISIT SHAWINIGAN.

The Montreal branch of the Society of Chemical Industry has arranged for a special spring meeting of the branch to be held at Shawinigan Falls, May 8 next. Private cars will leave Place Viger Station, Montreal, Friday, May 7, and will reach Montreal again Sunday morning, May 9. Fare, $12.50 round trip. All the electro-chemical plants at Shawinigan Falls will be open for inspection by the visitors, and on Saturday evening, May 8, a meeting will be held in the Technical Institute at Shawinigan Falls, when addresses will be delivered by Mr. H. W. Matheson, Mr. John Stadler and Mr. R. A. Witherspoon. Out-of-town members can secure their tickets from the Secretary, Geo. D. McIntyre, 536 Notre Dame De Grace Avenue, Montreal, by mailing their cheque.

TORONTO SECTIONS MEET.

On Friday evening, February 27, two sections of the Toronto branch of the Society of Chemical Industry met at the Engineers' Club—the Rubber Section and Packers' Section. Each section at 6.30 held their own informal dinner, after which adjournment was made to the lecture rooms. The Rubber Section was addressed by Mr. W. B. Wiegand, Director of Manufacturing of Ames, Holden & McCready, who gave a paper on "The Physics of the Rubber Stress Curve. Mr. Wiegand's paper, which will be published in full in our next issue, was one of the best technical presentations ever listened to at any scientific gathering in Toronto. It clearly showed that Mr. Wiegand had mastered his subject thoroughly, and the paper constitutes a valuable contribution to the science of the rubber industry.

The Packers' Section was addressed by Mr. J. C. Gillies, of the Wm. Davies Company, who gave an excellent paper on "Refrigeration," which was followed by a lively discussion, in which every member of the section present took an active part.

These section meetings of the Toronto branch are proving most sucessful, and each group is to be congratulated on the good work they are doing.

MANITOBA CHEMICAL SOCIETY.

Thirty members of the Manitoba Chemical Society met in the lecture theatre of the Chemistry Department of the University, March 9th, to hear a paper on the "Electrolytic Production of Oxygen," by Mr. C. Moody, of the Auto Lite Gas Company.

In order to further the interests of Manitoba chemists the Society decided to prepare an Appointment Register, and the Secretary was instructed to keep in touch with the local organization of the Canadian Manufacturers' Association, so that chemists seeking employment might be placed in touch with manufacturers requiring a chemist.

At the February meeting of the Society Professor M. A. Parker gave a paper on "Colloidal Chemistry," illustrated by many table demonstrations.

The April meeting will be a treat for the members, when they are to be the guests of L. D. Jackson at the plant of the Western Canada Flour Mills Co.

TORONTO RUBBER SECTION, SOCIETY OF CHEMICAL INDUSTRY.

On Friday evening, March 26th, the Rubber Section of the Toronto Branch, Society of Chemical Industry, held a well-attended and live meeting, led by Mr. Wallace, of the Dunlop Rubber Co. The general subject was the application of experimental physics to the rubber industry. Problems in drying, cooling, mixing mills, heat losses in curing and pressing rooms and in moulds, humidity of spreading shop, and methods of testing that will give results comparable to those found in use were discussed. A general discussion followed the paper in which specialists in chemistry, engineering and physics took part. The tendency seems to be, in the larger plants, to have a physicist develop and study more closely a number of problems that have never been fully worked over. From the standpoint of the engineer, the trend would seem to be to make the organization self-sustaining, as far as manufacturing special machinery is concerned. This arises from the fact that engineers who know rubber practice are specially qualified to design more efficient units and are more apt to develop new useful modifications than a company whose machinery may be of a general type needing a variety of modifications after reaching the plant.

PAINT AND VARNISH SUPERINTENDENTS MEET.

On Friday evening, March 26th, the Toronto Paint and Varnish Superintendents' Club held a well-attended meeting at the Engineers' Club. Mr. G. C. McEwen presided and after an informal dinner the members adjourned to one of the lecture rooms, where, following a short business session, an address was given by Professor Anderson, of the Faculty of Applied Science and Engineering, University of Toronto. The subject of the professor's discourse was "The Physical Basis of Color," and was followed with keen interest by those present. The first part of the address dealt with the formation of light, the visible spectrum and color, and was illustrated by several experiments and views. Coming to the pigments, the speaker referred particularly to the difference between the primary colors, as designated by the physicist, to those termed by the user of pigments. Continuing, the effects of stained glass were explained as being superior in color quality to those of pigments painted on an object, because in the stained glass, transmission of the color was accompanied by absorption, giving a range of color that cannot be obtained by reflection. At the conclusion of the address a short discussion followed, during which Professor Anderson's opinion on several practical problems was sought and readily given, giving an instructive conclusion to an already highly profitable evening.

The Paint and Varnish Superintendents' Club is proving itself to be a progressive organization, and the secretary, Mr. W. H. Holt, of the Glidden Varnish Company, is in communication with the Dominion and Ontario Departments of Mines regarding the development of resources for the obtaining of deposits used in the manufacture of pigments, and the co-operation of both Departments has been promised the club.

OTTAWA BRANCH OF THE SOCIETY OF CHEMICAL INDUSTRY.

"Chemical Patents" was the subject of a very interesting address given before the Ottawa Branch at its February meeting by Mr. A. E. MacRae, B.Sc., Examiner in the Chemical and Metallurgical Division of the Patent Office at Ottawa. Mr. MacRae traced the development of chemical patents and showed that of the first eighteen patents granted in England, twelve were for chemical products. He pointed out some of the features of the Canadian Patent Office and emphasized the fact that if better facilities were provided, much more could be accomplished. In this connection the speaker suggested that the fees collected by the Patent Office should not be regarded as a source of revenue for the country, but that they should be diverted to defray expenditures made for the improvement of the service. The patentee, said Mr. MacRae, should be regarded as a creator of national wealth.

In the discussion which followed the reading of the paper many interesting points were raised, principal among these being the question of whether patents should be granted for chemical products or only for the process by which any newly discovered chemical product is made, the majority of those present inclining to the latter view.

It was intimated at the meeting that Bill 76, which is intended to permit the manufacture and sale of alcohol for industrial purposes, duty free, would be introduced again at the coming session of Parliament, and a committee consisting of Dr. A. E. Macintyre, E. A. Thomson, and S. J. Cook, was appointed to take whatever steps might be desirable, on the part of the Ottawa Branch, towards facilitating the progress of this very important measure.

OBITUARY.

It is our sad duty to record the death from pneumonia of Mr. O. J. D. Thomas, late chief chemist to the E. B. Eddy Co. of Hull. Mr. Thomas came to this country from England some years ago and after spending some time in metallurgical work, engaged with the Eddy Company in 1917. He was well and very favorably known not only in Ottawa, but in many other parts of the Dominion, and was always one of the popular and active members of the Society of Chemical Industry in Ottawa, in which Branch he had been one of the members of the Executive Committee for the past two years. The funeral, which was conducted by the Masonic Brethren, was very largely attended, and many beautiful floral offerings went to show the esteem in which the deceased was held among his fellows. Mrs. Thomas and several small children remain to mourn the loss of their loved one and the sympathy of a large circle of friends, in which the Canadian Chemical Journal is proud to be numbered, goes out to them at this time.

OTTAWA NOTES.

The procession of chemists and other scientific members from the Civil Service goes on. The latest to go are: Mr. Cantelo, who has done excellent work at the Fuel Testing Plant of the Mines Branch for several years; Mr. Cantelo joins the staff of the Abitibi Pulp and Paper Co., at Iroquois Falls; Mr. John Blizard, the Mines Department efficient student of fuel problems, goes to the Bureau of Mines at Pittsburgh, Pa., where he starts at about double the salary paid him at Ottawa, and will carry on work closely related to that which he has been doing for Canada; Mr. Joseph Keele, also, who is one of a very small number who know anything about the ceramic industry in Canada and its possibilities of development, is going to Acadia University, where he will carry on his work.

INDUSTRIAL NOTES.

The Canadian Laboratory Supplies, Limited, are contemplating the manufacture of chemical glassware just as soon as larger premises are secured.

The lines they propose to manufacture will be lamp blown glassware, such as condensers, Soxhlet's apparatus, Fleming's and Johnson's combustion bulbs, gas analysis apparatus, such as Hempels, Buntes Orsats, etc. Graduated apparatus will be taken up later on. This is the first time anything of this nature has been attempted in Canada.

The Canadian Laboratory Supplies, Limited, have been doing quite a lot of repair work lately, but have had so many demands made upon them to go into the actual manufacturing end that they have now decided to add this new department, which should be a decided advantage to the chemist in need of special equipment.

Mr. J. H. Wilson, manager, has been very fortunate in securing as superintendent for their new department one of the finest glassblowers on this continent, who will supervise and check up all work turned out by the new plant.

They hope to begin actual manufacturing not later than the end of May or begining of June.

CATALOGUES RECEIVED.

Chemical Equipment and Vacuum Apparatus.

An 88-page, beautifully illustrated catalogue, describing the products of the Buffalo Foundry & Machine Co. of Buffalo, N.Y. The first seventeen pages comprises a section entitled "A Trip Through the Plant," commencing with the vacuum and organic chemical laboratory and taking one through the whole immense plant. The section on "Bufflovak" Dryers is particularly interesting, the descriptions of the dryers being plain and readable, so that anyone could tell exactly what he was buying. Then follows pages on the well-known Bufflovak vacuum pumps, condensers, impregnating apparatus, evaporators, concentrators, caustic plants, nitrators, reducers, reflux condensers, sulphonator, stills, atmospheric drum dryers, autocloves, caustic pots, fusion kettles, napthol and phenol stills, nitric acid plants, denitrator, acid eggs, crystallizer, and special chemical castings such as jacketed sulphur kettle, and dissolving tanks for ammonium nitrate. This catalogue is one that every plant manager should have on hand, and anyone interested may secure a copy by writing direct to the company.

ALUMINIUM TRANSMISSION LINES.

A recent survey made by the Commission of Conservation shows that on all lines in Canada operating at 10,000 volts and over there are 13,000 wire-miles of aluminium and 8,000 wire-miles of copper.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

An active market has prevailed in chemicals during March, with several prices advanced and all others holding firm. Alcohol has again advanced. Pure ethyl alcohol was quoted at $16 per gallon from the Government warehouses, and supplies of ethyl in the Toronto drug houses were entirely depleted during the past week. The alcohol situation demonstrates the pressing need for the Canadian Government to pass, without delay, the Excise Free Alcohol Bill that will be presented before the House at the present session. Industrial alcohol is a commodity that should be made just as easy for consumers to obtain as gasoline or any other necessity.

Notable advances have also occurred in caustic soda, magnesium sulphate, oxalic acid, soda ash, sodium, bichromate and sodium sulphate (Glaubers salt). Caustic soda has advanced 1½ cents; mag. sulphate, 1½ cents; and sodium bichromate, 15 to 20 cents, with no prospect of any easing off in price. Business in magnesium sulphate has been particularly good, the natural salt having been favorably received by the trade to such an extent that one dealer had his entire supply sold out and large advance orders received for further supply.

There is a shortage on the Canadian and American markets of sodium and calcium acid phosphates. During the past month there has been considerable demand for these acid phosphates by Canadian consumers and in some cases their wants could not be taken care of. The shortage is just as apparent in the American market, due to difficulties experienced in the phosphate mining fields in the Southern States, where trouble in securing sufficient labor has held up production. But there are other products in which there is a shortage on the Canadian market, which, with a little co-operation between firms, might be avoided. We refer particularly to cinnamic acid, magnesium oxide (light) (burnt alum, tri-chlor-acetic acid and alpha napthol.

COLOR PRICES.

It will be noticed that we have added to our market quotations this month prices on colors, including coal tar colors, basic, direct and sulphur colors. These quotations. as in the case of our chemical, metal and oil quotations, are the latest prices as quoted by the leading wholesalers to the trade at Toronto, Montreal and other Canadian centres, and, as with the other quotations, are revised to the first of the month. This is the only complete list of color quotations giving Canadian prices, published in Canada, and will not only prove of value to the purchasers of dyes, but also to the color dealers, as providing a complete memorandum of color prices current in the Canadian market.

DYESTUFFS.

Direct and definite statements are now available from those who are in very close touch with the production of dyes in England and the United States. It may be stated that British dye-stuff factories are meeting at least 80 per cent. of the demands of the textile industries at home. While it is possible to obtain a permit for export to the colonies, it is not the policy of the British Government to allow an export business to be built up until such a time

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as all requirements for home consumption are met. This tends to restrict imports to Canada from England. Some idea of the magnitude of British operations may be had when it is understood that one of the companies amalgamated with the Dyestuffs Corporation, and by no means the largest, is employing over 7,000 persons.

Ninety-nine and a quarter per cent. of the various commercial dye-stuffs produced by Germany before the war are being manufactured on a commercial scale in England. All the vat dyestuffs, with four or five exceptions, are being produced by one firm in England, and it is expected that these will be manufactured before the close of this year. The "New Methylene Blues," G. G. F. and N, are not yet being produced, as well as some of the Rhodamines. It may be definitely stated that some of the dyestuffs made almost exclusively by Germany before the war are being made in England now, whose practical working properties show superiority in purity and color strength to anything ever produced in Germany. A notable instance is the old Methylene Blue, BB. zinc-free.

This superiority is also being maintained in the United States, and we now have a direct cotton dyestuff and a couple color quite superior to the old German products. A limited number of bright blue vat dyes are being produced in the United States, and the samples being shown are excellent, but deliveries are still irregular. Several of the Durand Huguerin Chrome Mordant colors and some of those of Bayer are not yet being produced commercially in England.

As is well known, chemists in charge of the application of dyestuffs are the first to receive samples of new colors or reproductions of old ones, and from such authoritative sources progress of manufactures may be determined.

Germany is realizing her lost position in this industry, and it is anticipated by manufacturers, both in England and in the United States, that her big attack to regain her lost position is being planned for the year 1921.

OILS.

All oils have shot up during the month, Pennsylvania crude advancing from $5 to $6.15 per bbl. and mid. continent crude from $2.75 to $3.00. Fuel oil is quoted at 12 cents per gallon at Toronto and Montreal.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

Acetanilid, C. P.	Lb.	$ .. — .70
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.04½—.05½
Acetic acid, refined	Lb.	.18½—.19½
Acetone	Lb.	.18½—.23½
Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Alum, Ammonia, lump and ground	100 Lbs	.. — 5.00
Aluminium Sulphate, high grade, bags.	100 Lbs.	3.25— 3.50
Ammonia, Aqua 26	Lb.	.10½— .16
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.18— .25
Ammonia Iodide	Lb.	.. — 6.30
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Arsenic	Lb.	.. — .09
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.30
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Caffeine, English	Lb.	.. — 8.50
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	.. —35.00
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Camphor Monobromate	Lb.	.. — 5.75
Carbolic Acid, white crystals	Lb.	.. — .30
Carbon Bisulphide, in drums	100 Lb.	.12— .13
Carbon tetrachloride, drums	Lb.	.17— .20
Caustic Soda, ground, bbl.	Lb.	.06¾—.07½
Chalk, Precipitated	Lb.	.04¼— .06
Chloroform	Lb.	.45— .55
China Clay, imported	Per Ton	35.00—45.00
Citric Acid, domestic, crystals	Lb.	.. — 1.15
Cobalt Oxide, black	Lb.	.. — 1.65
Copperas (Iron Sulphate) crystals	Lb.	.02¼—.02½
Copperas (Iron Sulphate) sugar	Lb.	.. —.02½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.11¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.40— .45
Formaldehyde	Lb.	.65— .85
Formic Acid, 75%	Lb.	.40— .42
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Glycerine, drum, C.P.	Lb.	.. — .28
Hydrofluoric Acid, 60%	Lb.	.. — .25
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10¼
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.05— .06
Mag. Sulphate, B.P., Medicinal	Single Ton	.. —75.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	.. —65.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Naphthaline flake	Lb.	.10— .11
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Oxalic Acid	Lb.	.35— .40
Oleic Acid	Lb.	.. — .23
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.10
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash).	Sticks	.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.75— .85
Phenacetin	Lb.	3.10— 3.25
Quinine	Oz.	1.02— 1.50
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Saccharin	Lb.	4.75— 5.00
Salicylic Acid	Lb.	.90— .95
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Nitrate, refined	100 Lbs.	6.75— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.34— .40
Sodium Bisulphite, powder	Lb.	.. —.08½
Sodium Nitrite	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Silicate, according to density.	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.00— 2.25
	Per Cwt. in Car Lots	.. — 1.60
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .42
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tannic Acid, commercial	Lb.	.90— .95
Tartaric Acid, crystals or powdered	Lb.	.78— .80
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.. —.08¼
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting	Per Ton	25.00—30.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zino Dust	Lb.	.13—.14½

Metals.

Aluminium, No. 1, 98-99%	Lb.	.32— .40
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Fluorspar, ground	Ton	.. —30.00
Fluorspar, ground	Lb.	.. — .06
Fluorspar, lump	Lb.	.. — .05
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.11½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50

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Zinc, sheets	Lb.	— .22

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Motor Gasoline	Gal.	— .37
Motor Gasoline (service stations)	Gal.	— .40
Lighting Gasoline	Gal.	— .42
Naphtha	Gal.	— .36
Coal Oil	Gal.	—.24½
Fuel Oil	Gal.	— .12
Mid. Continent Crude (42 W. gal.)	Bbl.	— 3.50
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Crude Creosote Oil	Bbl.	16.00—18.00
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Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	— .75
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Naphthalin Balls	Lb.	— .18
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Anise Oil	Lb.	2.10— 2.25
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Castor Oil (Commercial), in bbl. lots	Lb.	.25— .27
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	— 2.87
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	— 2.90
Gums—		
Indian, No. 1A	Lb.	— .44
Indian, No. 1	Lb.	— .42
Tragacanth, No. 1, Ribbon	Lb.	— 5.00
Tragacanth, No. 1, Flake	Lb.	— 4.75
Tragacanth, Turkey	Lb.	— 4.25
Arabic, clear amber sorts	Lb.	— .21
Arabic, regular grain No. 4 and No. 5	Lb.	— .22
Arabic, regular grain No. 2	Lb.	—.22½
Arabic, white sorts	Lb.	— .40
Arabic, powdered, No. 1	Lb.	— .40
Arabic, powdered, No. 2	Lb.	— .39

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Steamed Bone Meal	Per Ton	—45.00
Pure Ground Blood, per unit of Ammonia		— 7.50
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Animal Tankage, per unit of Bone Phosphate of lime		— .10

Coal Tar Colors.

Acid Colors.

	Per Lb.
Azo carmine	$ 6.75
crimson	2.80
cyanine 5R	3.40
navy blue	—
rubein	3.10
yellow	3.40
Amaranth O	3.95
Black	1.80
4B	1.70
NBR	1.70
Blue, concentrated	6.75
B	6.20
R	4.50
4B	7.85
G	13.50
Bordeaux	2.25
Brilliant red	4.10
Brown	2.80
B	2.80
Carmoisine	3.10
Chinoline yellow	6.75
Croceine scarlet	3.95
scarlet R	1.15
scarlet 3B	3.40
Cyanine blue	5.60
Cyanol blue	20.70
Diamond black	3.40
Eosine	8.95
B	11.20
J	7.85
Fast red A	2.25
red E	2.80
blue	5.60
brown, red shades	4.75
crimson	4.50
neutral gray	4.10
Ponceau orange 2G	3.10
red	2.80
light yellow 2G	3.65
yellow G	2.80
Green	3.40
2G	13.50
Magenta, acid	11.20
Maroon	3.40
Metanil, yellow	2.80
Naphthol blue 3K	14.00
green	5.60
yellow S	2.50
Naphthylamine red	7.85
Navy blue	6.75
Orange A	1.15
K	1.15
Patent blue	39.20
Pink	6.75
Red	6.45
4B	2.50
Scarlet	1.95
Y	2.25
pulp	2.25
pulp 2R	2.80
Silk blue S	5.00
black PX	2.15
Tartrazine	2.80
Violet	8.40
3AN	5.60
4B	6.75
6B	8.95
10B	11.20
R	3.40
Wood green S. Swiss	8.95
domestic	7.25
green W, mixture	6.75
Yellow	2.25
2G	4.50
R	1.40

Basic Colors.

	Per Lb.
Alkali blue	$ 7.85
violet	20.70
Auramine O	3.95
Bismarck brown R	1.40
Brown Y	1.30
Blue, bright	4.50
Brilliant green crystals	7.85
Chrysoidine	1.25
yellow G	2.25
Crystal violet	6.75
Erythrosine	6.15
Fuchsine	6.75
Magenta	8.95
Malachite green powder	5.00
crystals	5.85
Methyl violet base	3.40
concentrated	5.60
B	3.95
2B	3.95
3B	3.95
4B extra	4.20
4B	4.20
5B	6.00
6B	7.25
6B extra	8.40
6B crystals	7.85
Methylene blue, ex. conc.	4.50
blue B	3.65
blue B conc.	5.00
blue BB (A)	5.00
green	10.10
Orange	3.40
Purple	6.20
Rhodamine B	7.85
B extra conc.	36.40
6G extra	Nominal
Safranine, 2Y	7.85
B	5.60
Y	7.85
Victoria blue	7.25
blue B	7.85
blue R	10.65
blue 4R	13.45
green	22.40
red	8.95
violet 4BS	6.75
yellow	8.95

Direct Colors.

	Per Lb.
Benzo Brown	$ 2.25
dark green	6.45
fast orange	8.40
scarlet 4BS	20.40
yellow A	1.70
navy blue	3.95
orange	5.60
purpurine	8.95
4B	2.80
5B	7.25
sky blue	8.95
Black	1.15
Blue	3.40
B	3.95
2B	1.30
H	3.10
L	3.40
3	5.00

Brown	2.25
C	3.95
2G	2.80
MB	2.80
No. 22	3.10
R	3.65
Bordeaux	4.50
Chrysamine	2.25
yellow G	2.80
Chrysophenine	3.40
G	7.25
Congo red	1.40
W	4.80
Cotton blue	28.00
red 5B	5.60
orange G	—
orange R	—
yellow	—
Developed blue	4.50
black	3.95
diazo brilliant scarlet 10B	10.65
primuline	5.60
Diamine blue, 2B	2.00
brown	6.75
Bordeaux	6.75
Bordeaux B	5.20
fast yellow	5.15
green	3.40
pink	15.70
rose	15.70
scarlet	2.00
skyblue 2F	7.25
yellow	8.95
Fast pink	4.75
yellow	3.65
Garnet	3.65
Green B	2.25
Y	3.95
Gray	5.00
Khaki	4.10
Orange	2.80
3G	3.95
R	2.80
Oxamine blue B S	9.50
pure blue	9.25
red B	8.70
Pink	6.75
Red	2.25
Red 4B	7.00
maroon	3.65
imperial	3.70
salmon	4.50
Rubine	4.75
Sky blue fast to acid	6.75
2F	5.60
G	3.95
Union navy blue	3.40
dark blue	3.95
dark green	5.00
deep navy blue B	5.75
Violet	3.10
B concentrated	4 20
R concentrated	3.25
Yellow	3.95
C	3.10
G	3.95
R	3.40

Sulphur Colors.

	Per Lb.
Black	.35
Blue	2.80
3G	1.70
R	3.40
Brown	.55
Green	2.25
3G	3.00
Khaki G	1.40
R	1.40
Olive	1.40
Yellow	1.95
G	2.25

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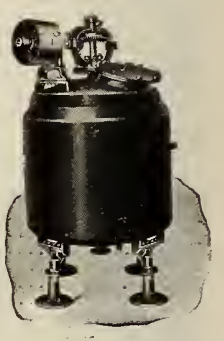

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All manufacturers who could possibly employ one or more chemical students during the vacation period or could take on a graduate at work which would allow them to gain useful plant or laboratory experience, are requested to write us stating what they are prepared to do. Strain a point, if necessary, and make this investment on behalf of your industry and your particular organization. You will get value received from these men, and at the same time will be doing something you can be proud of. State your best offer for a good man.

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NT 4050	40,608	4	24'0"	12'0"	1/4"
NT 4051	55,500	14	25'0"	15'0"	5/16" & 1/4"
NT 4052	64,000	17	30'0"	12'0"	3/8" & 1/4"
TP 1653	250,000	1	43'0"	25'0"	
NT 4055	282,000	1	40'0"	30'0"	5/16" & 1/4"

Horizontal

Item No.	Capacity, Gals.	No. of Tanks.	Diameter.	Height.	Thickness of Shell.
NT 4024	5,200	124	6'0"	24'10"	3/8"
NT 4029	7,500	18	8'0"	20'0"	1/2"
NT 4033	11,300	45	8'0"	30'0"	1/2"
NT 4034	17,000	38	9'0"	36'0"	3/8"

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Item Number	Capacity Gals.	No. of Tanks	Diameter	Height	Thickness of Shell	Openings	Have Been Used For	Remarks
NT 4043	10,000	1	12'0"	11'10"	1/4"		Soda ash for caustic plant.	Complete with cover and manhole.
NT 4044	10,000	1	12'0"	11'10"	1/4"		Lime rock for caustic plant.	Complete with cover and manhole.
NT 4045	10,000	2	12'9"	10' 6"	1/4"	1–18" manhole 4" and 2 1/2" connections at bottom.	Alcohol denaturing.	Bevel gear agitator drive with tight and loose pulleys, gauge glasses on side.
NT 4053	90,000	2	36'0"	11'10"	1/4"		Thickener.	Complete with thickener mechanism and intermediate tray.
NT 4054	99,000	1	36'0"	13' 0"	1/4"		Thickener.	Complete with thickener mechanism and intermediate tray and cover.

Horizontal, steel

Item Number	Capacity Gals.	No. of Tanks	Diameter	Length	Thickness of Shell	Openings	Have Been Used For	Remarks.
NT 4015	2,000	20	5'0"	14'0"	1/4"	2–4" and 1–18" nozzle in top, 2–4" nozzles in bottom.	Weak alcohol.	8 New, 12 used.
NT 4021	2,300	8	6'0"	10'9"	3/8"	18" manhole in top, 1–4" and 1–3" nozzle in bottom.	Acid feed.	Convex ends. Tested to 60 pounds pressure. 2 New, 6 used.
NT 4022	2,550	3	6'0"	12'0"			Intermittent for ether and alcohol equipment.	All new—have not been used.
NT 4031	11,300	48	8'0"	30'0"	1/2"	Complete with plug valve and operating levers.	Acid mixing.	Convex ends. 2 propellor agitators in each tank, gear drive with pulleys.
NT 4032	11,300	18	8'0"	30'0"	1/2"	Complete with plug valve and operating levers.	Acid mixing.	2 Propellor type agitators in each tank, gear drive with pulleys 12" diameter. 7 New, 11 used.

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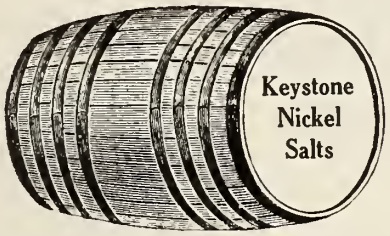

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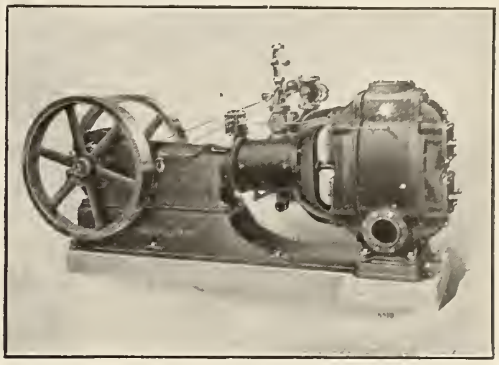

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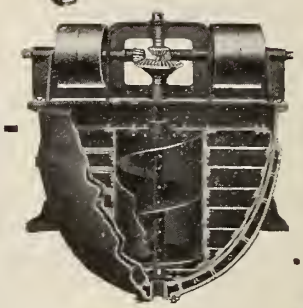

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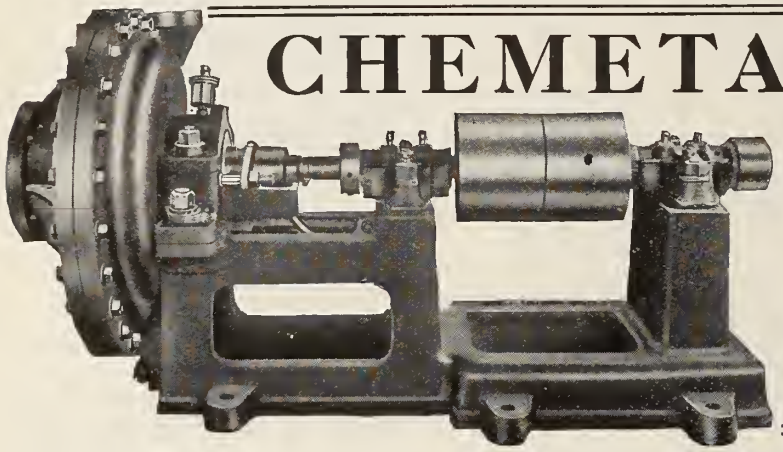

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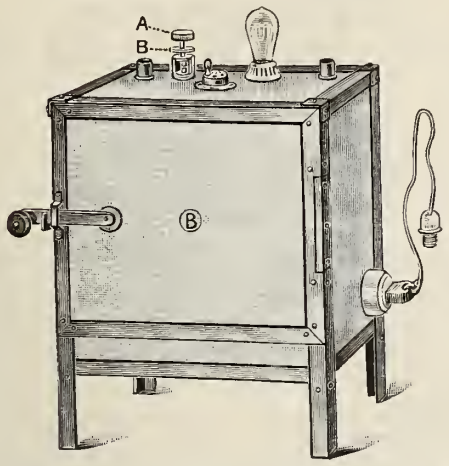

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Hon. H. Mills, Minister

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Forests: Pulpwoods in abundance afford the raw material for the pulp and paper industry. Hardwood is available for the production of wood alcohol and other by-products from wood distillation.

Minerals: In 1918 Ontario produced 45 per cent. of the total mineral output of Canada. Practically all minerals, with the exception of coal and tin, are found in the premier mineral Province of Canada. Statistics of output, as compiled by the Ontario Bureau of Mines, show a valuation of $80,308,972. First among the metallics were nickel, silver, gold and copper. The total value of the chief metals produced in Ontario up to the end of 1918 is as follows:

Silver	$185,027,590	Nickel	$138,010,542
Copper	49,947,080	Pig Iron	78,925,917
Gold	50,864,863	Cobalt	5,918,899

Non-metallic products include actinolite, arsenic, barite, cement, clay and shale for ceramic industries, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lime, mica, mineral waters, natural gas, petroleum, quartz, salt, sand and gravel, stone for all purposes, and talc.

Industrial Opportunities: Midway between West and East and bordered on the south by the Great Lakes, Ontario occupies a strategic commercial position among the Provinces of Canada. Transportation facilities, both by rail and water, are unexcelled, and present every opportunity for development of the mining, metallurgical and chemical industries. Developed hydro-electric power is available at very low rates from the Hydro-Electric Power Commission of Ontario. Already electro-metallurgical and electro-chemical industries have become established, more particularly in the Niagara peninsula.

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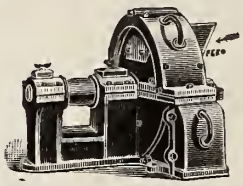

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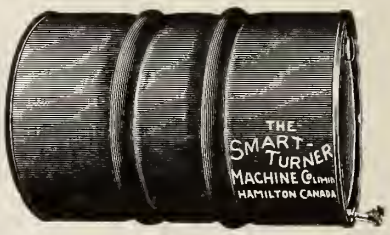

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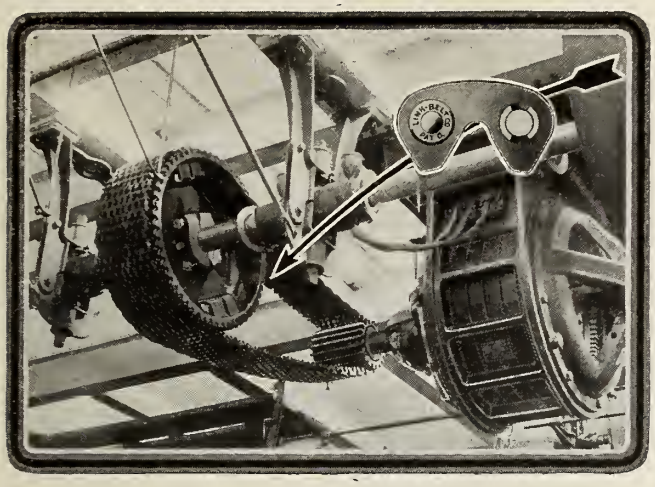

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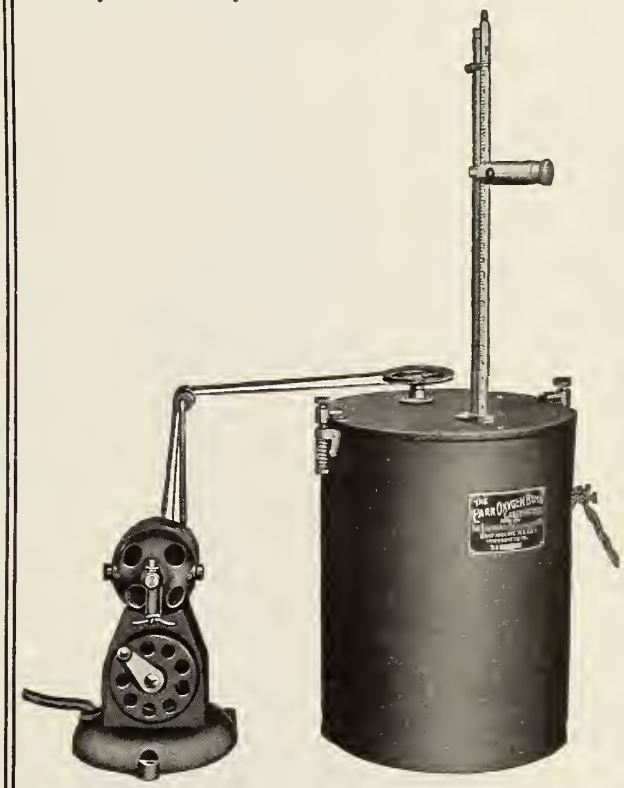

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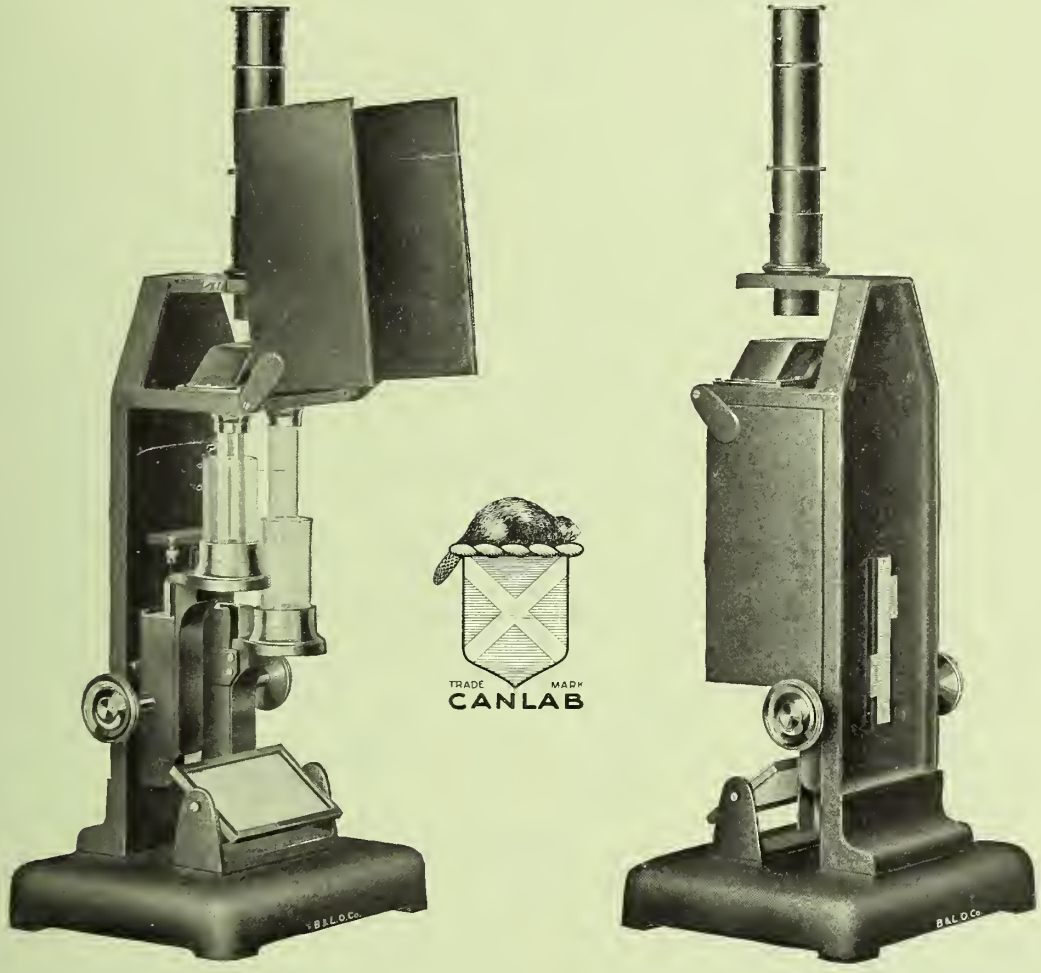

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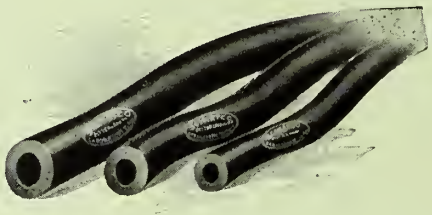

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BUREAU OF MINES

Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Summary of Mineral Statistics, 1919.

Product.		Quantity.		Value.	
		1918.	1919.	1918.	1919.
Metallic:					
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, hollow building		.....	.....	195,588	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,720
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc.		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	80,308,972	57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

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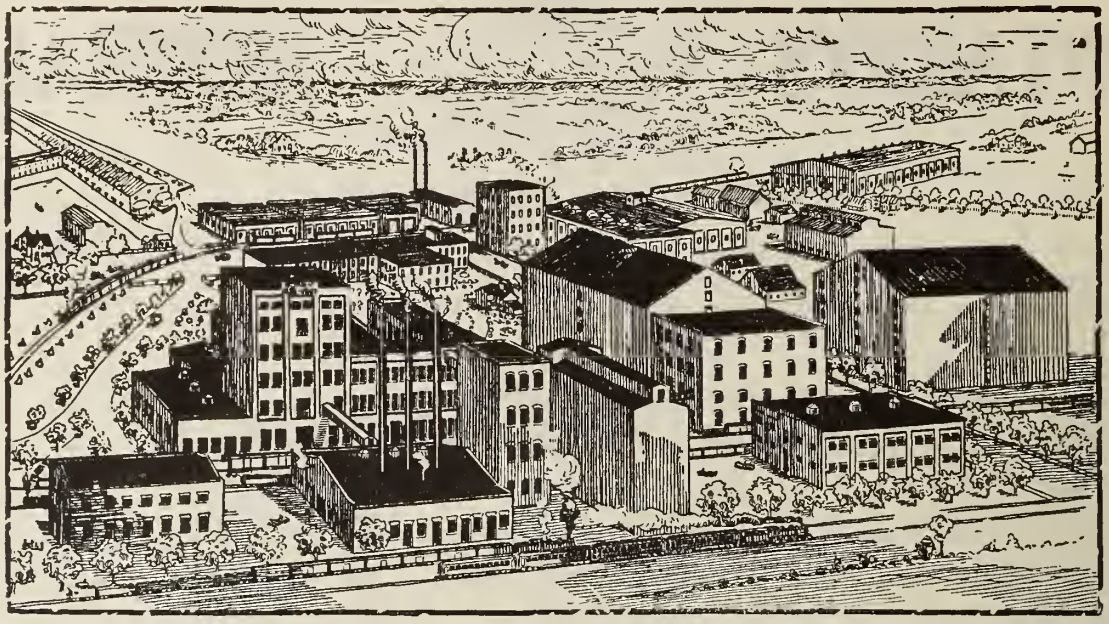

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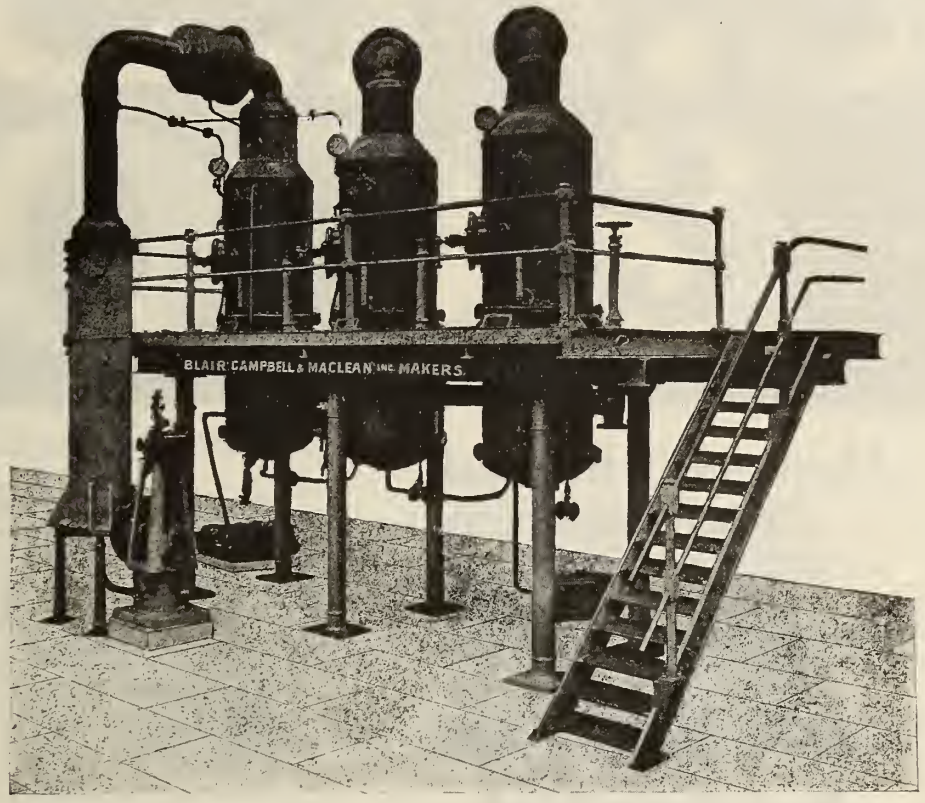

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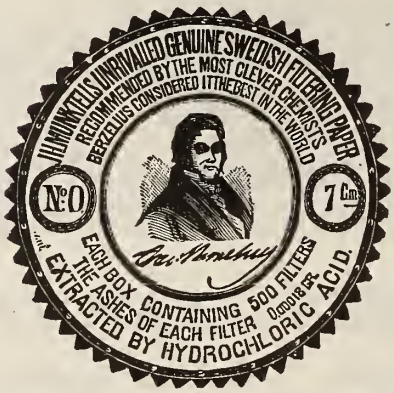
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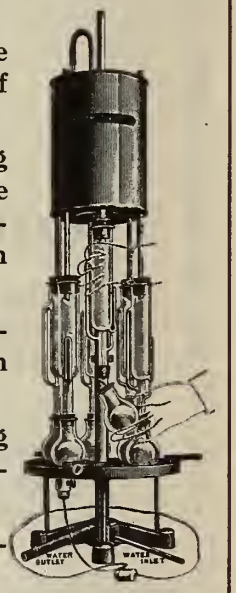

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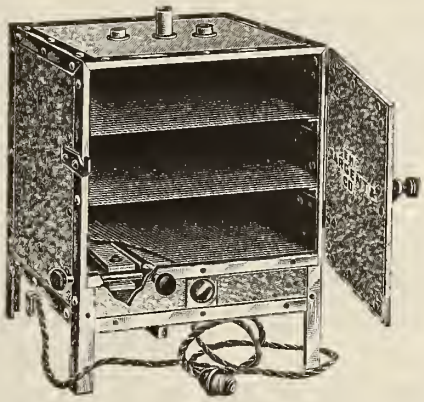

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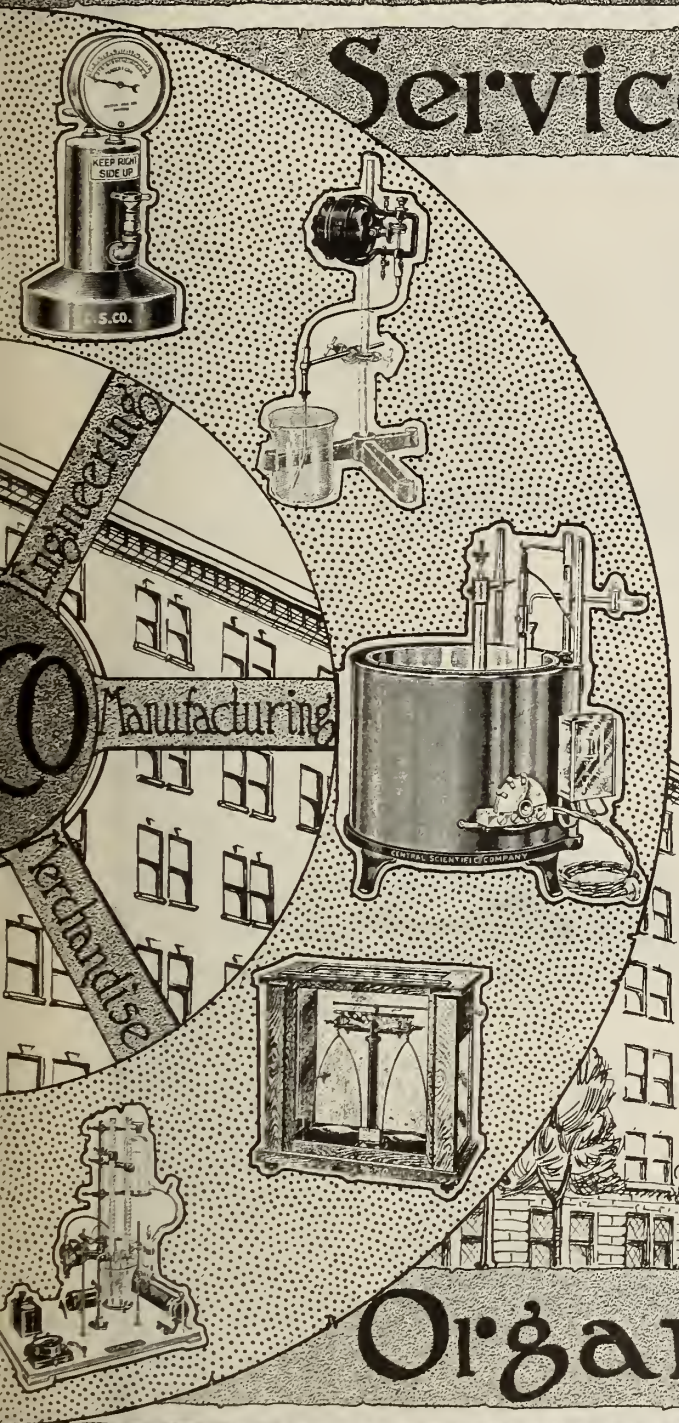

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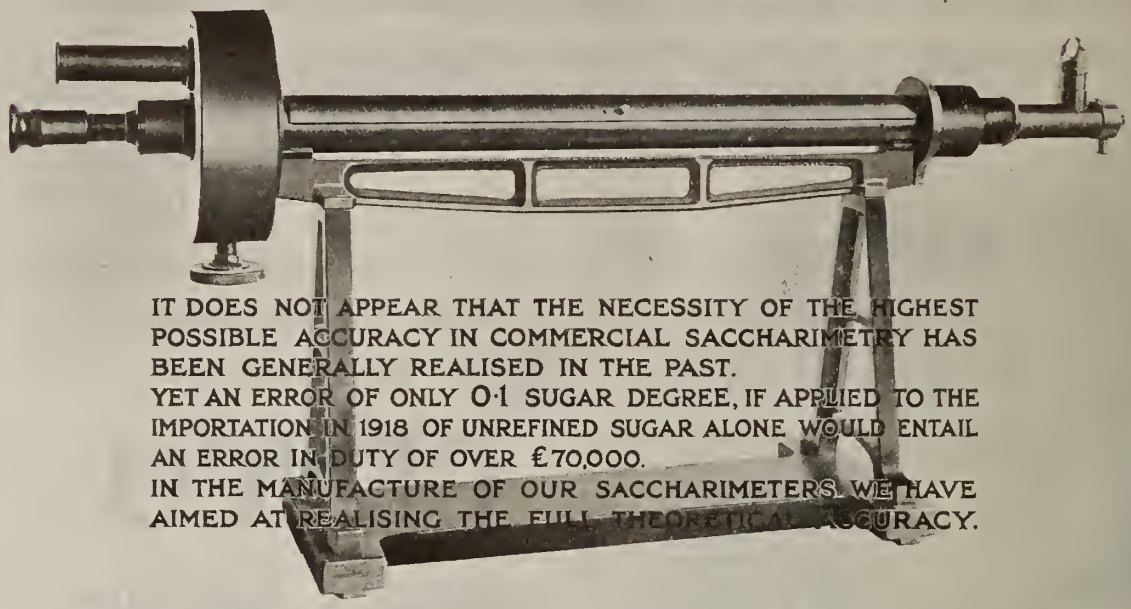

IT DOES NOT APPEAR THAT THE NECESSITY OF THE HIGHEST POSSIBLE ACCURACY IN COMMERCIAL SACCHARIMETRY HAS BEEN GENERALLY REALISED IN THE PAST.
YET AN ERROR OF ONLY 0·1 SUGAR DEGREE, IF APPLIED TO THE IMPORTATION IN 1918 OF UNREFINED SUGAR ALONE WOULD ENTAIL AN ERROR IN DUTY OF OVER £70,000.
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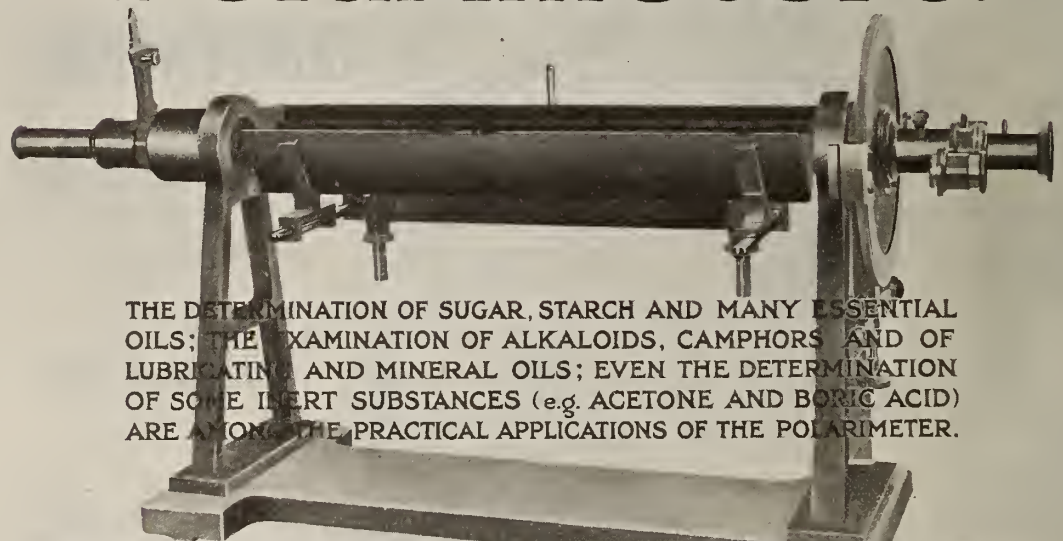

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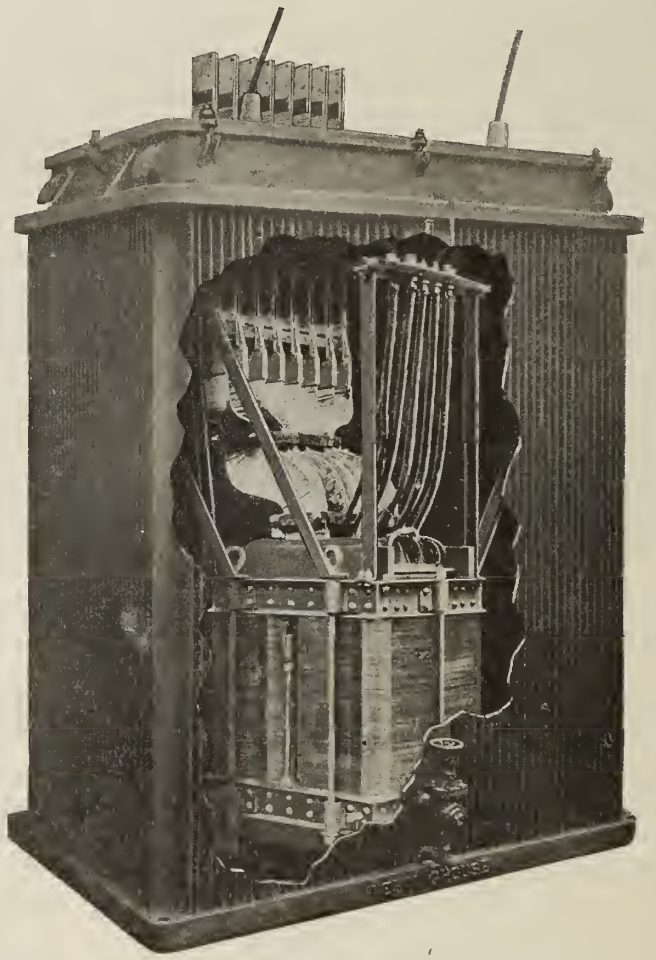

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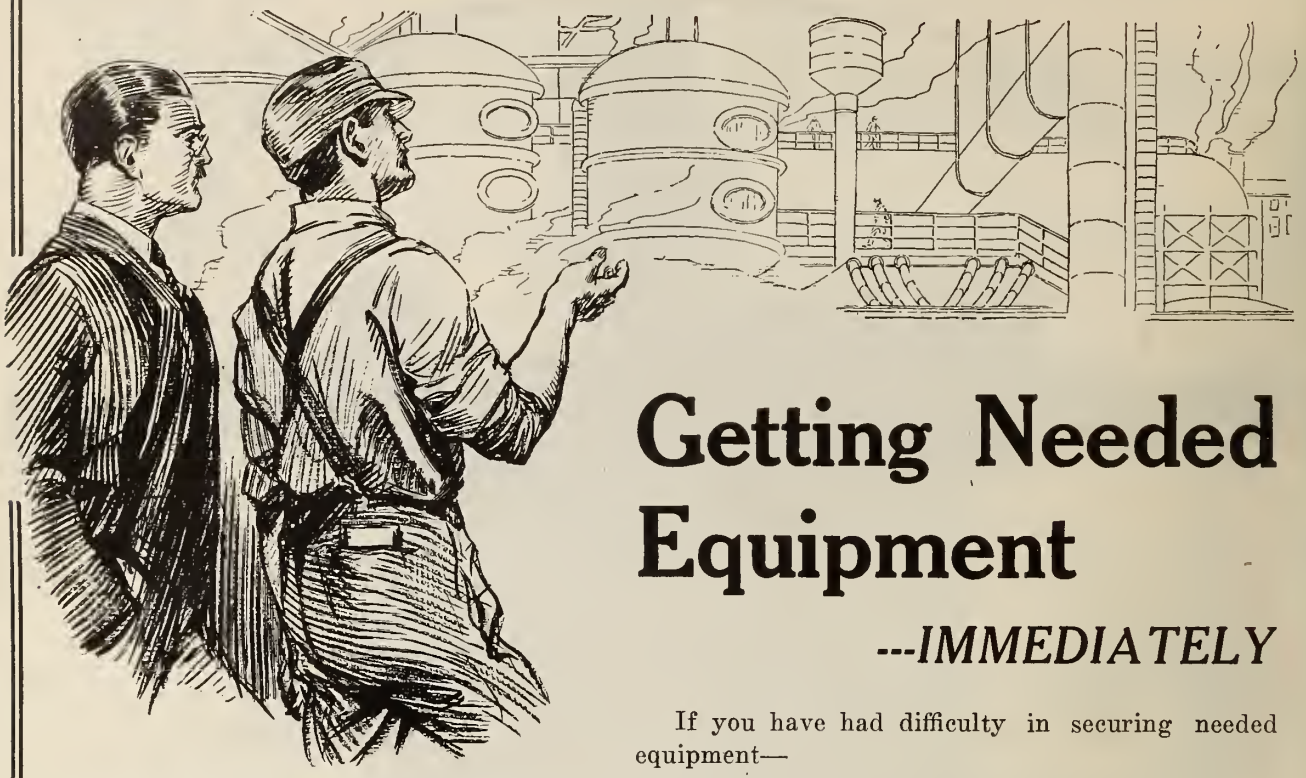

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SODA BICHROMATE
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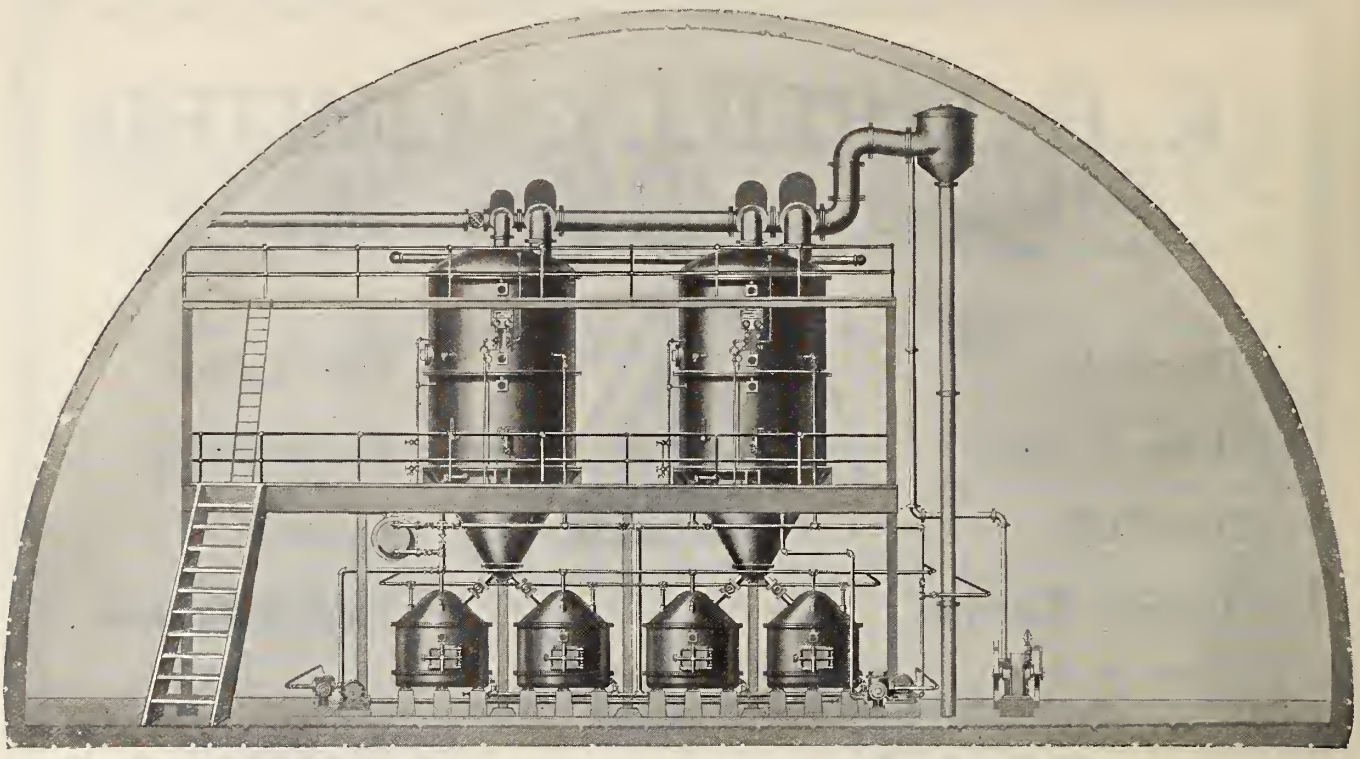

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THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

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EDITORIALS

BACKING UP THE TECHNICAL MAN.

In the report of an address recently delivered by the Hon. N. W. Rowell, on the general work of the Dominion Government during 1919, the matter of Civil Service Reform and the elimination of patronage receives due attention. After outlining the meritorious results which should accrue from a happy application of the legislation, his remarks are completed by the following statement:

"It may be added that with regard to trained experts, commercial institutions are able to offer very much higher salaries than the Government, according to all past precedent, can afford to pay; and while under the re-classification there is a substantial advance in the salaries of many of such experts, in view of outside competition, the Government faces serious difficulty in retaining them in the Service."

This frank admission on the part of the Government does not go quite far enough. In our opinion, it would have been better to have said that in lieu of this condition, the Government has lost the services of a high proportion of their best technical men in many branches, and those who remain have been thrust into such a discontented state of mind that the whole technical service of the Government may be said to be largely demoralized, compared with what it should be at the present time.

It is a most remarkable thing that a re-classification, which was destined to give the Civil Servant (1) better pay for the services rendered, (2) promotion on merit, should produce the fruit it has. Technical men have found that to secure either the better pay or the promotion on merit, it was necessary to give their services to organizations which were more keenly awake to their value than the representatives of the public as a whole.

According to past precedent, the Dominion Government cannot afford to pay for the services of these men. It is hard to conceive that men in public life should have such a conception of the industrial intelligence of Canadian people. Surely this is not the way to apply the principles of efficiency to the business of the country. Where would we be soon if nothing were done except that which complied with all past precedent?

In general, the Government has made a grave mistake in its treatment of technical men. Those who have in the past considered and measured greatness and power according to the ability of one man to sway, lead or impress others by the written or spoken word, must realize that there exists a variety and type of mind equal at least to their own. That man whose knowledge of material things, matter, and the forces of energy and their application, is an expert whose attainments are worthy and whose rewards should be measured in the largest units. These silent men who never ran for office in their life, who never reach the public press with general remarks that are great because they made them, are in reality the backbone of our national opportunities for progress. They are doing the things that must be done

Saving at the Spiggot, Wasting at the Bung, with the Dominion Government leading the way.

before future statesmen can refer to the glory and grandeur of this country. And yet we hear that the Dominion Government cannot afford to retain their services.

An ancient myth holds sway in Ottawa. It is considered very bad form to grade a technical man as either equal to, or superior to the clerical brain-stealer who may receive and pass on the information given him by the technical man. The utterly foolish method of attempting to classify and compare types of services that have no fundamental principles in common is the pit that the Government has fallen into. A commercial organization is not so essentially worried about comparisons between the salaries of its stenographers and its chief geologists.

Undoubtedly the Civil Service Commission is going very thoroughly into the question of a proper compensation for technical men. Such an investigation should reveal that conditions in some countries are much superior, and that the average university teacher, with his opportunities for outside work, is

relatively much better paid than the government employee.

In the Laboratory Service, the maximum compensation from that given a laboratory helper to chief government analyst, runs from $840 to $4200 per annum. As there are very few in this latter class, the average outlook for a university graduate at the maximum, after some years, would be $3000. The same graduate, applying himself, should be able to reach at least the position of associate professor at a university in the same length of time. Should he do so, at Columbia University, New York, he would receive $5000, at McGill, $4000, or should he become a high school principal in Toronto or Ottawa, he would receive from $4300 to $4500.

Comparison between salaries paid by the United States Government and the Dominion Government for similar duties are rather instructive.

	U.S.A.	Canada
Laboratory Helper	$840 to $1200	$600 to $840
Laboratory Assistant	1200 to 1800	900 to 1200
Assistant Chemist	2400 to 3000	1320 to 1680
Associate Chemist	3240 to 3840	1800 to 2400
Chemist	4140 to 5040	2520 to 3000

How can the Dominion Government expect live men capable and trained for advancement in many lines to apply their special training in a service where such a limited opportunity for advancement is given, and for this opportunity such a comparatively small salary? This is a case where the Government should lead and not follow afar off.

As stated above, the fruits of the policy are being manifested in many ways, and the startling fact that technical men are leaving the service, and in some instances doubling their salaries, should allow the Government to remedy the cause in spite of "all past precedent."

CANADIAN MADE "ASPIRIN."

If there is one pharmaceutical product more than another which has been brought to the front in every possible way, it is the German product 'aspirin." This chemical, acetylsalicylic acid, has attained such a remarkable consumption that there is a permanent world demand for it.

During the war, quantity production was established in Toronto, after some considerable experimental work, by the Chemical Products of Canada, Ltd. What was accomplished then was a distinct credit to the technical men who undertook to establish this particular industry here.

Generally speaking, Canada did not find herself in a position where she could compete in world markets in many synthetic organic chemicals. In this particular line, however, we are observing at the present time one of the biggest chemical undertakings which has been started in this country, and Canada bids fair to become one of the largest producers in the world of a product which was at one time a German monopoly.

Most of our munition plants have been torn down, but the Trenton plant of the Imperial Munition Board was sold and remained for the most part as the war left it. This plant, with its capacity for producing heavy acids, made an ideal location for large scale chemical operations. The Chemical Products of Canada, Ltd., having demonstrated that they could make certain chemicals and compete in world markets, have undertaken to produce a world's supply of some of these at Trenton, Ont. With the technical and financial backing that is available, there is little doubt but that the reorganized Chemical Products, Limited, will, in a short time, be not only shipping to all foreign countries, but may even be commanding the market.

New chemical industries are among those that do not impress the average Canadian sufficiently. His lack of knowledge or achievement has made him unprogressive. This stage should have passed with the war. Canadian chemists were called upon to create "impossible" industries right in our own cities, and without fail they overcome all difficulties and supplied the allies with large quantities of necessary materials. This part of Canada's war record has never been widely written, but the fruits of it are very evident in the expanding chemical industries of the Dominion.

With the new equipment and using well-tried processes, free from any patent entanglements, the Chemical Products Co. anticipate producing 1,080,000 lbs. of acetylsalicylic acid (aspirin) per annum. The world uses about 6,000,000 lbs. a year, with an apparently increasing demand.

The strategic value of a Canadian location for such an industry is apparent when the open American market (both North and South), is considered, as well as the British Empire and Eastern Countries. China alone consumes 1,500,000 lbs. of aspirin per annum; Russia 1,000,000 lbs.

When the scientific method of development is followed from the laboratory to the plant and then to the expanded plant, there have been very few failures, and it should be with a distinct sense of gratification that Canadians view the revived Trenton Munition Plant producing a chemical product in quantities sufficient to command the respect of foreign producers.

It is but a very short time since this same plant was producing commodities as injurious to German life as its new product will be to one of Germany's most spectacular Chemical industries.

To think that Canada may become a contender in the world's markets for aspirin, with every chance of dominating the field, is certainly seeing things from a new angle. In fact, for those who understand its significance, it is indeed a sign that we are getting on.

CONVENTION OF CANADIAN CHEMISTS.

A convention of persons interested in any one particular thing, be it chemistry, agriculture, religion, or even the erection of a political platform, may be said to have two chief features, the disbursement of classified information through papers, addresses and discussions, and, secondly, the personal or social benefits accruing from intercourse with those interested in kindred problems. From the first of these a greater knowledge of the subject in which one is interested is obviously obtained; and from the second, though perhaps it may not at once be so clearly discerned, one is bound to receive much that makes life worth while. A general stepping-up of the daily human voltage should follow and be evident in the work of those who regularly tune up by the convention method.

Both these cardinal points will be strongly in evidence at the Convention of Canadian Chemists at Toronto, on the 27 and 28th of this month. The papers so far arranged for, as a glance at the preliminary program in this number will show, are all on exceedingly important matters, and will undoubtedly be pregnant with much splendid information.

That there will be plenty of discussion, goes without saying, for chemists are noted for their willingness, when in convention assembled, to speak out their own minds, whether it be on points raised by the papers presented, or on matters concerning their organization and professional welfare. To make any convention really successful, good live discussion, participated in by everyone who believes he has something to say or to ask, is absolutely essential, and there need be no fear of discussion being shut off at the coming gathering of chemists.

The third factor that will make this year's convention a success will be the exhibits of chemicals and plant and laboratory equipment. The number of firms that have secured space for exhibits has been most encouraging, and this will certainly be a very important feature.

One thing will be noted—the convention is not a hotel lobby affair. The University of Toronto has placed its very best at the disposal of visiting chemists, and the whole arrangement should combine university, professional and business interests in a most satisfactory way. The presence of Dr. Charles H. Herty, editor, international leader of technical thought, and field-marshal of the great army of American chemists, as chief guest, will make May 27th and 28th, 1920, memorable dates in the progress of chemistry in Canada.

Dominion Good Roads Association—
Annual meeting, 1920, Winnipeg, June 3-4.

THE AIMS AND OBJECTS OF THE SOCIETY OF CHEMICAL INDUSTRY.

By the Hon. Secretary Alfred Burton.

As this subject has been under discussion at various meetings of the Society, it may not be out of place to state wherein the Society might have definite aims and objects.

During the war the Society took its share in rendering war service to its country, and now that this service is no longer required, the Society has an equally necessary function to perform in the public service by stimulating chemical industries. In this way an organization would be produced through which scientific methods may be applied to the solution of problems of production; by standardizing methods of practice; by promoting efficiency in production, and by aiding and assisting in industrial conferences and in matters relating to original scientific research.

The selection and training of both executive and worker is now recognized as a science, and the opportunity for research work is equalled only by its value to industry.

Original research can be carried out both in the university and the factory, and should furnish information of inestimable worth in determining "a fair day's work," which is the rock upon which so often the co-operation of labor and management is wrecked.

The education of most value to the management, the salesman, and the technical man, is the cause of continual dispute between practice and theory. This question can only be solved by the application of a scientific method of research by those of wide enough vision to appreciate both the "practical" and the "theoretical."

The opportunity for service in giving publicity to such principles and methods is a worthy object for such a Society, as those engaged in the plants in a quiet way working out these fundamental principles are men who are too busy to realize the true scope and value to the world of these principles if set forth in such a way as to be generally available.

Co-operation between the Society, the universities, the industry, and the press, would educate the whole industrial world to the benefits to be derived by increasing production per man, while decreasing the fatigue per hour, and thereby enlisting the services of those who realize that "He profits most who serves best."

Another aim should be to stimulate the professional spirit amongst its members at the expense of the competitive. This is important if we are to place ourselves on a par with the more established professions that have learned the value of combining their energies in the interests of the profession, by the exchange and co-ordination of the knowledge possessed by those engaged in applying scientific methods to the problems of production.

In the past we have had round-table talks following formal papers, and to some extent personal and intimate exchanges of experiences by those who attended such meetings. Stimulation by intercourse with those from other sections of the country has led us to establish annual conventions which bring viewpoints from abroad to bear upon local conditions. A discussion of methods under ordinary conditions is mutually advantageous. Thus that service may be rendered to industry for which the Society was in part organized.

Co-operating with other societies is a most important factor, and is something which should be considered continually. The interest that members of various technical

societies take in each other is mutually good and indicates life.

The development of the professional standards of the industrial chemist cannot be overlooked nor overestimated if the profession at large is to reach the high plane occupied by better known and older professions. When this has been done manufacturers will more readily appreciate what standards to require in the way of experience and attainments when placing their business in the hands of another, and can be assured of a source of information in regard to such men, which is beyond question.

The next few years will give great opportunities to the industrial chemist who can develop means towards increased production, conservation of energy, reduction of labor turnover, and the education of the future citizens of industry who must replace the losses created by the war, and the public service which can be rendered by the members of this Society who possess the necessary qualifications is very great.

Organized labor has eventually seen the necessity for increased efficiency of the worker if each is to receive increased possessions for his labor, and the Society can make a common meeting ground and promote the opportunity for mutual education along these lines, both through written articles and the education of the undergraduates of the universities, and other schools where the necessity for both specialized and broad development is vital to our future prosperity.

The value and extent of the service which this Society renders to industry will depend upon the energy and enthusiasm each member devotes to these activities, and the personal benefit accruing to each member will depend upon the time and thought given in furthering the objects of the Society and in adding to its strength.

Industry to-day has become a profession, so much so that it is impossible any longer for the one who directs to grow up with the business in the old sense. The man who would be competent to successfully engage in industry must be educated, in theory, in technique and have wisdom due to some experience in the field of endeavor which he would enter. That this is realized is evident by the increase in the number of schools of instruction in which the Government, Chambers of Commerce and trade associations are co-operating in the dissemination of not only knowledge, but of the principles and methods which, a few years ago, would have been carefully guarded as trade secrets. At the present time those who do not keep abreast of the times by constantly keeping in touch with the ablest men and leaders in their lines, are distinctly on the downgrade which leads to failure.

The more widely the Society's influence can be carried, the greater will be its accomplishment, and each one added will increase not alone the value of membership, but also the opportunity for service.

GRAPHITE MINERS WANT BETTER ROADWAY.

A delegation recently waited upon the Ontario Minister of Public Works, Hon. H. C. Biggs, asking for improvement in the eight-mile roadway leading from the Ottawa to Kingston highway to the graphite mines in Leeds County, so as to facilitate the getting out of the ore to the main road. The delegation impressed on the Minister the importance of the graphite industry and the need for better transportation if it was to be properly developed. The Minister pointed out that this district was still in the colonization area and could not come under the roads programme for this season.

DIRECTOR OF U.S. BUREAU OF MINES RESIGNS.

Dr. Van. H. Manning, Director of the United States Bureau of Mines, Department of the Interior, has tendered his resignation, effective June 1, to President Wilson. Dr. Manning is leaving the Government service to accept the position as Director of Research with the recently organized American Petroleum Institute, the most important body of petroleum men in the United States.

In his letter to the President, Dr. Manning says: "I hereby tender you my resignation, to take effect June 1, 1920, as director of the Bureau of Mines."

"It will be with reluctance and deep regret that I shall sever my connection with the Department of the Interior after thirty-four years of active service therein, and it is the opportunity of being able to continue in another capacity, the work for the advancement of purposes fostered by the Department that has been the chief factor in determining my decision to resign.

"I take this opportunity to express my sincere appreciation of the confidence that you have reposed in me as a public official and of the cordial co-operation of the departmental executives whom I have been able to serve. Especially I appreciate your constant help in my efforts to develop an organization that has at heart the welfare of the public, the advancement of the mineral industry, and the safety of the two million workers who contribute to the success of that industry.

"In leaving the Government service there comes to me, as it has over and over again, the thought that although this Government spends each year many millions of dollars in useful scientific work for the benefit of the whole people, the monetary recognition of its scientific and technical servants is not sufficient to enable them to continue in the service for the people. This has been especially true within the last few years when it has been impossible for many men to remain in the Government service.

"With the marvelous expansion of the industry in this country and the growing necessity of science to industry, the scientific bureaus have been utterly unable to hold their assistants against the competition of industry which is taking their highly trained men at salaries the Government does not pay or even approach.

"I feel very deeply that there ought to be more adequate compensation for the scientific and technical men in the Government service so that none of them may be compelled to accept positions on the outside.

"Many of these scientific men are of fine type for Government work; care little for the commercial field; take an intense professional interest in their tasks and are of inestimable value to the Government."

The nomination of Dr. Frederick G. Cottrell for director of the Bureau of Mines, Department of the Interior, was sent to the Senate May 5th by President Wilson, to take the place of Dr. Van. H. Manning, resigned. Dr. Cottrell was the assistant director of the Bureau under Dr. Manning.

Mr. Geo. H. Tomlinson, well-known as a leader in research work on waste wood products, has accepted a position as research chemist with the Riordan Pulp and Paper Company, Ltd., at Hawkesbury, Ont. Prior to his going to Hawkesbury, Mr. Tomlinson was associated with Messrs. Kinsinger,Bruce & Co, Niagara Falls, Ont.

The Chemistry of Maple Products

The Chemical Analysis of Maple Sap and Sugars, with Methods of Determining Adulteration.

By J. F. SNELL, Macdonald College, Que.

The sap of the sugar maple (*acer saccharum, Marsh*) has a density of 1.010 to 1.025, averaging about 1.015. In sucrose content individual trees vary widely. The average found by Wiley[1] in 15 trees (described as swamp, white, black rock and striped maple, *acer Pennsylvanicum*) tapped at Lunenburg, Vt., in 1884, was 3.75, but the majority of these trees stood in the open and the average for sugar maples in general would probably not exceed three per cent. Results as high as ten per cent have been obtained in exceptional cases[2]. The annual yield of sugar per tree would probably average between 1.5 and 2.5 lbs. per tree[3]. As high a yield as 17 gallons of sap containing 8.67 lbs. sugar has been noted[4].

The quantity of invert sugar in fresh, early run sap is very low. Wiley found no reducing sugar and Sy[5] less than one per cent of the total sugar. Even in the concentrated forms of maple syrup and maple sugar very low percentages are sometimes found. Bryan[6] has reported one Canadian syrup quite free from reducing sugar, another with only 0.02, still another with only 0.05 per cent and a Vermont maple sugar[7] with only .09 per cent.

The sap is very faintly acid. Edson[8] reports reactions amounting to from 0.5 to 9.0 "per cent N/100 acid." Wiley[9], however, found fresh sap rarely to contain as much as .005% acid calculated as malic, and frequently the acidity fell as low as .0005%. The chief bases in its salts are lime and potash,[10] and the chief acid, malic acid. There is a small amount of albumin (.0088 to .019 per cent), which coagulates and forms a scum when the sap is boiled in the evaporator.

Maple Sugar Sand.

When the evaporating sap approaches the density of maple syrup a precipitate forms, which, according to the analyses of Warren[11], and of Snell and Lochhead[12], consists of 65 to 80 per cent calcium malate, 6 to 18.5 per cent silica with minor quantities of manganese, magnesium, phosphorus and iron, and from 10 to 17 per cent of undetermined matter. A pound of malic acid can be made from about three pounds of sugar sand, such as is ordinarily obtained from syrup makers who have washed the precipitate with hot water and dried it promptly.

Fermentation occurs readily in moist sugar sand, resulting in destruction of the malic acid.

Estimates of the annual production of maple sugar sand in the United States and Canada are based upon rather uncertain data. The amount may be as low as 100 or as high as 350 tons a year. All of this has been wasted in the past, except that in the last five or six years a few hundred pounds have been used in the experimental manufacture of the acid. So far as the writer knows, the demand for malic acid is limited to the requirements of scientific laboratories, but this demand is increasing and maple sugar sand appears to be the most economical source of the acid at present. The amount produced by the average syrup maker is small—perhaps ten to thirty pounds annually—but a price equal to, or a little greater than that of maple sugar would probably be an inducement to many to save the sand, or "niter," as it is often inappropriately called.

Maple Syrup.

When the concentrating sap in the evaporator has reached a density of 30.5° Beaume (hot), or a boiling point seven Fahrenheit degrees above the boiling point of water, or when the liquid forms a sheet in pouring off the edge of a dipper, it is drawn off and is either allowed to settle or, better, is filtered through flannel or felt to remove the sugar sand. On cooling, the syrup should show a density of 35° Bé. (sp. gr. 1.320) and a water content of 35 per cent. An Imperial gallon of such maple syrup weighs 13 lbs. 3 oz. Syrup with excess water is not only illegal, but is apt to ferment. On the other hand, syrup with less than 32 per cent water is pretty sure to deposit crystals of sugar in cold storage.

According to our investigations[13], syrup makers using the hydrometer as a finishing test obtain more uniform results than those depending upon either the thermometer or the dipper, but are a little more disposed to over-concentrate the syrup. Probably a density of 30 or 30¼ Bé at (or just below) the boiling point would give better results than 30½. In placing the syrups within the most desirable range of water content (32.5 to 35.5 per cent) the hydrometer and thermometer tests are about equal and both decidedly superior to the dipper test.

Maple Cream.

In making maple cream, syrup which has been freed from sugar sand, is boiled to a temperature of about 230°F., or until long bubbles can be blown through a knotted straw[14]. It is then poured into clean pans in lots of about five pounds and cooled quickly to 70 or 80° without disturbance. Upon reaching the desired temperature (judged by the hand to avoid the disturbing effect of a thermometer) it is stirred vigorously with hardwood paddles for twenty

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[1]Wiley, H. W., U.S. Dept. Agr., Bureau Chem. Bull. 5, Pt. IV, 1885.

[2]Wiley, *loc cit.*

[3]The average yield of Wiley's 15 trees in 1885 was 1.062 grams sucrose, which would be equivalent to 2½ lbs. maple sugar per tree. The U. S. census for 1910 gives the number of trees tapped in 1909 as nearly 19 million. Reduced to terms of maple sugar containing five per cent moisture this amounts to about 44.5 million pounds, an average of 2⅓ lbs. per tree.

[4]Wiley, *loc cit.*

[5]Sy, A. P., *Journ. Franklin Inst.*, Oct., 1908, p. 19 of reprint.

[6]U. S. Dept. Agr., Bureau Chem. Bull. 134 (1910), pp. 47-49.

[7]U. S. Dept. Agr. Bull. 466 (1917), p. 23.

[8]Vermont Agr. Expt. Sta., Bull. 167 (1912), pp. 391-407.

[9]*Loc cit.*

[10]Analyses of the ash of the sap of one hard maple (*Acer saccharum*, Marsh) and one soft maple (*Acer sacchariuum. L.*) were published by Shedd, *Journ. Agr. Research* 5 Wiley, U. S. Dept. Agr. Bureau of Chem., Bull. 5, p. 193, reports the mineral matter of the sap of one tree.

[11]Warren, *Journ. Amer. Chem. Soc.* 33 (1911), 1205.

[12]Snell and Lochhead, *Journ. Ind. and Eng. Chem.*, 6 (1914) 301.

[13]Snell, Vermont Maple Sugar Makers' Assoc'n., 24th Annual Report (1917), pp. 89-101.

minutes. This induces the formation of small crystals, giving a creamy product, resembling the confectioner's "fondant." The cream is then poured into glass containers and sealed. If properly prepared it will keep for years.

Maple Sugar.

Syrup boiled to the maple cream consistency will form cakes or soft maple sugar if poured into moulds without the treatment necessary to make cream, but even for tub sugar (i.e., sugar to be sold in tubs) it is usual to boil to 233°F. or higher. For a cake sugar the boiling is continued until a temperature of 238 to 245° is reached. With syrup from early run saps 238°-240° will usually give a soft and 242°-245° a hard sugar. With late run syrup, which usually contains more invert sugar, temperatures a little higher are used. When the desired temperature is attained, the syrup is stirred and either cast into moulds, in which it is again stirred for a time, or stirred as it cools in the pan. The temperature to which the syrup needs to be heated depends to some extent upon the amount of stirring that is to be done, as the evaporation of water, of course, continues during the stirring. Grained or stirred sugar is concentrated to a high degree and stirred constantly during cooling, so as to give a loose, dry product.

Composition.

Maple products are held in esteem on account of the peculiar flavoring matter they contain. The nature of this flavoring substance has not been elucidated. Attempts to imitate it have been made, but the writer has yet to meet with an imitation flavoring as agreeable as the natural one. Syrups which have been locally overheated in evaporation have the flavor of caramel mingled with the true maple flavor and are not in general held in as high esteem as the mild flavored products of careful evaporation. Some persons, however, prefer the strong, "tangy" flavor of the caramelized products.

Commercially, light-colored syrups and sugars are graded higher than those of darker color. Goods made from fresh sap by rapid, shallow boiling have very little color. It is doubtful if the pure sap contains any coloring matter at all. Color may arise from (1) contamination from the bark, (2) growth of micro-organisms in the sap, or (3) caramelization in the evaporator, (4) action of adventitious tannin on the iron of the evaporator.

Direct polarizations of +42.10 to +69.00°V (Avg., +60.60°) and invert polarizations of —17.00 to —24.97° (Avg., —22.34°) have been found in genuine syrups[15]. These figures correspond to 47.20 to 70.46 per cent sucrose by the Clerget formula. In sugars the sucrose content runs from 57.04 to 98.62[16], with an average of 90.69 per cent. There is rarely any optical activity in the invert solution at 87° C., 458 syrups out of 481 giving zero readings, 21 negative readings (Max. —2.4) and two positive readings (Max. —1.0). Adulteration with glucose syrup can, therefore, be detected with certainty by polariscopic observations.

Invert sugar, though seldom entirely absent, is small in quantity in carefully made and well-kept products. Ninety per cent of Bryan's 481 syrups contained less than three per cent of reducing sugars (calculated as invert) and over fifty per cent of them less than one per cent. The average percentage of invert sugar was only 1.47, the maximum (in a fermented syrup) 11.01. Maple sugars are richer in invert sugar than the syrups—on account of the higher temperatures to which they have been exposed. The average found among 228 well-preserved United States sugars by Bryan was 3.09 per cent. In all his 363 samples the average was 6.19 per cent. A maximum of 37.30 was found in a poor quality sugar from Pennsylvania.

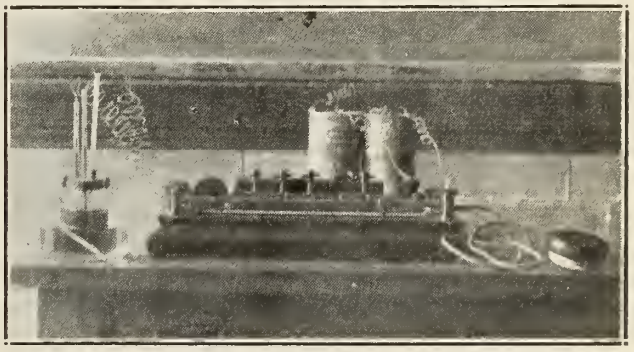
The salts of maple products are the constituents upon which the analyst must rely in detecting adulteration with cane or beet products. The methods used comprise:

1. Ash determinations—total, soluble and insoluble ash, their respective alkalinities and ratios of these. In some instances also specific ash constituents, e.g., P_2O_5, SO_3 may be useful.
2. Determinations of (assumed) malic acid by precipitations with a calcium salt and alcohol.
3. Precipitation with basic lead acetate or with normal lead acetate.
4. Measurements of electrical conductivity.

The Association of Official Agricultural Chemists recognizes the ash methods, malic acid value (Cowles method, in which calcium acetate is used) and one of the lead subacetate methods—the Winton method[17]. At its meeting, in November, 1919, it adopted also tentatively the Canadian lead and the conductivity value methods.

The Canadian Lead Method.

The Canadian lead method originated in the Laboratory of the Inland Revenue Department (now known as the Foods and Drugs Laboratories), having been suggested by observations of the voluminous precipitate obtained in the clarification of maple products for polariscopic observation[18]. As adopted (tentatively) by the A. O. A. C., it is as follows:



Apparatus Used in Determining the Conductivity Value of Maple Syrup.

At the left—the conductivity cell comprising a 100 c.c. beaker surrounded by a crystallizing dish, and a dipping electrode with thermometer 20°-30° C. in tenths. In the centre—the Wheatstone bridge. At the right—the telephone. In the background—two dry cells.

Reagent—Standard Basic Lead Acetate Solution.

Boil 280 grams Horne's lead subacetate with 500 c.c. water. When solution is complete, except for a slight sediment, pour off or allow to cool and dilute with recently boiled distilled water to a density of 1.25 at 20°.

Determination.—Weigh the quantity of prepared syrup containing 25 grams dry mater, transfer to a 100 c.c. volumetric flask, cool to 20° and make up to the mark.

Pipette, 20 c.c. into a large test tube, add 2 c.c. of the standard basic lead acetate and mix. Allow to stand two

[14]Dodd, Vermont Maple Sugar Makers' Ass'n, 24th Ann. Rep. (1917), pp. 80-88.

[15]Bryan, U. S. Dept. Agr. Bur. Chem. Bull. 134 (1910), p. 49.

[16]Bryan, U.S. Dept. Agr. Bull. 466 (1917), p. 26.

[17]Directions for these determinations will be found in the Association's book of methods

[18]Thos. MacFarlane, Lab. Inland Rev. Dept., Ottawa, Bull. 120 (1906). Centrifugal volumetric methods based on the same reaction had previously been proposed by Hortvet *Journ. Amer. Chem. Soc.*, 26 (1904), 1545, and by Jones, Vermont Agr. Expt. Sta., 18th Ann. Rept. (1904-5), 322.

hours. Filter on a tared Gooch, having an asbestos mat at least 3 mm. thick, wash four or five times with boiling water, dry at 100° and weigh. Multiply the weight of the dry precipitate by 20.

The results obtained with the use of a basic lead acetate solution prepared by boiling together litharge, normal lead acetate and water are not identical with those obtained with the solution prepared as above. As a rule, the Horne's salt gives a more basic lead acetate solution and a higher lead value in a given syrup than the solution prepared from the litharge and normal acetate by the A. O. A. C. directions. Exceptions to this rule have been noted, however, and there are probably other circumstances affecting the results.

A meritorious feature of the Canadian lead number is that when maple syrup is diluted with a syrup of equal density made from a refined sugar the value falls off more rapidly than the proportion of genuine maple syrup. Syrups with less than twenty per cent of genuine maple give no precipitate whatever, and those with fifty per cent maple give results which might have been expected from those containing twenty or thirty per cent.[19].

The Conductivity Method.

This method, proposed by the writer in 1911[20], has the advantage of being very rapid and also that of showing apparently a narrower range of its results in genuine syrups than any of the other established methods. The apparatus required (see illustration) comprises (1) a Wheatstone bridge with galvanometer or induction coil and telephone, (2) a dipping electrode. The writer uses a Kohlrausch Universal Bridge made by Philip Harris & Co., Birmingham. This carries its own coil and has standard resistances of 0.1, 1.0, 10, 100 and 1000 ohms. (of which only the 10 and 100 are used in this work) and a 25 cm. slide wire graduated so as to read directly the multiplier of the standard resistance. The coil is operated by two dry cells in series and a Deveau telephone is used to detect the point of balance between the arms of the bridge. A very satisfactory dip electrode with fixed vertical electrodes was designed for this work by Mr. G. J. VanZoeren[21]. A 100 cc. beaker is used as conductivity cell and this is surrounded by a larger beaker or a crystallizing dish to serve as a water bath for the adjustment of the temperature of the cell.

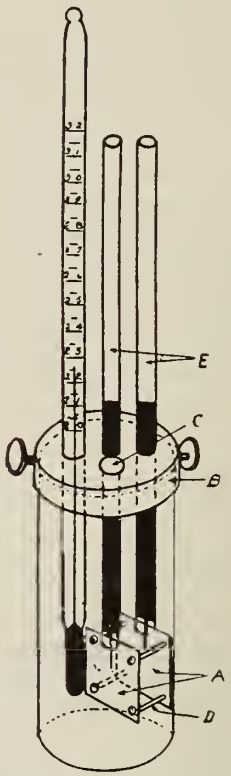
As adopted by the A. O. A. C., the directions for the method are as follows:

Conductivity Value—Tentative.

Determination of the Cell Constant.—Prepare 0.1, 0.02, and 0.01 M. potassium chloride solutions by dissolving respectively 7.4560, 1.4912 and .7456 grams pure, ignited potassium chloride in distilled water and making up to 1000 cc. at 18°C. In a 100 cc. beaker place 60 cc. of the 0.01 M. solution, insert a VanZoeren or other dipping electrode, bring to 25° and measure the electrical resistance. Multiply the number of ohms found by 141.2. Rinse the electrode and beaker with the .02 M. solution, put in 60 c.c. of this solution, measure its resistance at 25° and multiply by 276.8. Rinse with the 0.1 M. solution, put in 60 cc., measure its resistance at 25° and multiply by 1289. Average the three results (which should agree within one per cent) and multiply by 10^{-5}.

Method.—Weigh out the quantity of syrup containing 22 grams dry matter. Transfer to a 100 cc. volumetric flask with warm water, cool and make up to the mark. Measure 60 cc. of the solution into a 100 cc. beaker, insert a VanZoeren or other dipping electrode, bring to 25°C. (± 0.0°) and measure the electrical resistance. Divide the constant of the cell by the observed number of ohms and multiply the result by 10^5.

The method does not require extreme precision in the preparation of the solution and, ordinarily, instead of preparing a solution containing 22 per cent dry matter, it suffices to measure 20 cc. of the syrup into the cell (previously prepared by boiling to 104° C. and filtering through cotton wool) from a 25 cc. graduate, drain well, and rinse into the beaker with two portions of 20 cc. distilled water. The accompanying table gives collaborative results on seven syrups by the two modifications of the method.



The VanZoeren Dipping Electrode.

A—Platinum electrodes 2 x 2 cm. one cm. apart. D—Glass pins. B—Vulcanite cap. E—Glass tubes containing mercury, connected with electrodes by sealed-in platinum wires. The glass cylinder protects the electrodes and thermometer.

In a paper presented to the Royal Society of Canada, in 1919, a comparison was made of the maximum and minimum values obtained in genuine maple syrups and sugars by the various methods of analysis. Expressed in terms of per cent of the minimum value found, the ranges of the various values are as follows: Ratio of the alkalinity of the soluble to that of the insoluble ash, 990 per cent; ratio soluble ash to insoluble ash, 846; malic acid value, Hortvet method, 793; Cowles method, 767; Hortvet method, with blank, 452; weight of insoluble ash, 742; alkalinity soluble ash, 571; Winton lead number, 371; weight of soluble ash, 355; Canadian lead number (in a much smaller number of samples, all of Canadian origin), 335; alkalinity of the soluble ash, 312; weight of total ash, 202. The best of these show variations amounting to two to three hundred per cent of lowest values found. On the other hand, the conductivity values of 333 syrups (mostly Canadian), as determined by the rough, rapid method of measurement from a graduate, have all fallen within a range of 140 per cent of the minimum value found. This minimum was 96,

[19]Snell and Scott, *Journ. Ind. Eng. Chem.* 5 (1913), 993.

[20]Snell, *Journ. Ind. Eng. Chem.* 5 (1913), 740; 8 (1916), 331; Snell and VanZoeren ibid, 8 (1916), 421.

[21]*Journ. Amer. Chem. Soc.* 38 (1916), 652.

while the maximum (found in a low grade, kettle boiled syrup) was 230. It is rare to find a conductivity value below 110 or above 200 in a genuine syrup.

As a means of detecting adulteration with refined sugar, therefore, the conductivity method compares favorably with any of the other methods used both as regards speed and as regards the significance of the value determined. Of course adulteration may be so practised as to evade this test, but the same is true of any other individual test. Maple products showing normal conductivity values must be subjected to other processes of analysis, but those yielding values outside the range found in genuine goods cannot be genuine and the conductivity value may be confidently recommended as the first test to apply on the analysis of maple sugar, maple cream or maple syrup.

Table showing collaborative determinations of conductivity values of maple syrups obtained in the Chemical Laboratories of the Massachusetts Institute of Technology and Macdonald College:

Syrup No.	Using a solution of 22 g. dry matter to 100 cc.			Using 20 cc. Syrup.			
	Woodman	McFarlane	Snell	Woodman	McFarlane	Snell	VanZoeren
1	166	154	167	165	166	173	171
2	173	172	173	171	177	179	180
3	171	166	172	171	168	177	178
4	128	128	131	123	128	132	...
5	149	148	152	148	154	153	154
6	139	138	141	137	138	144	145
7	191	192	195	192	195	202	203

MINERAL RESOURCES OF SOUTHEASTERN ONTARIO.*

By W. J. EVANS.

As early as 1820, the iron ores of Southeastern Ontario were recognized as being of good quality, and one of the first iron smelters in Ontario was built at Marmora, in 1820. No permanent success has followed the numerous attempts made since that time to smelt these ores, owing to the fact that they are refractory magnetites. The advent of the electric furnace has overcome the chief difficulty in the using of these ores, but the Ontario Government should grant a bonus in the shape of a reduction in the present electric power rates, while the Dominion Government should grant a bonus of three dollars per ton on steel made from Canadian ores. There is sufficient iron ore in sight in Eastern Ontario to keep a 500-ton plant in operation for one hundred years. Many of these iron ore bodies are more valuable for the rare metals they contain than for their iron content, and these rare metals could be saved, converted into ferro-alloys or retained in the steel. Why should millions of tons of iron ore, containing an average of 50 to 60 per cent metallic iron, lie dormant year by year in Canada, and 94% of all the iron ores smelted in the Dominion be imported?

Gold.

The first gold discovered in Ontario was found in Hastings County, Southeastern Ontario, in 1866, on property known as the Richardson Mine. The gold was found in a ferroginous, earthy matter, in epidotic and dolomite schist. One opening, 15 feet high, by 5 feet wide, by 10 feet long, yielded over $30,000 in gold. There are numerous occurrences of gold throughout Eastern Ontario, but little development work has been done on any of the properties except one, which has been worked to a depth of 500 feet, and it will require careful diamond-drill work to ascertain whether the values continue to considerable depth. The mine worked to the 500 feet level has shipped $328,000 in gold, which would lead one to believe that were these occurrences situated in the Porcupine region in Northern Ontario, many of them would undoubtedly be working to-day.

Silver.

Silver has not been found in Southeastern Ontario in any considerable quantity. Some of the galena found there contains as high as 80 ounces of silver per ton.

Lead.

One galena property, near Bannockburn, in Hastings County, turned out pig lead for about two years, but a slump in the lead market is said to have been responsible for the closing down of this mine. There are occurrences of galena in eleven townships of Southeastern Ontario.

Copper.

Copper pyrites has been found in many places in Southeastern Ontario, and a smelter was worked near Eldorado Station and copper produced for about a year. The ore at depth required concentration and the owners of the property apparently could not raise the necessary capital, and closed down the mine.

Other Minerals.

Other mineral deposits found in Southeastern Ontario are: Iron pyrites, arsenic, molybdenite, tetrahedite (sulphantimonite of copper), vanadium, fluorspar, talc, mica, marble, quartzite, trap-rock, corundum, limestone, actinolite and garnet.

In summing up, it will appear that Southeastern Ontario requires a careful and up-to-date mineral survey. Without any Government assistance whatever, and without the expenditure of any large amount of capital, Southeastern Ontario has shown that it possesses the largest corundum deposits on the continent, extensive deposits of marble, the largest body of talc in North America, extensive bodies of fluorspar of which some optical varieties have been sold for as high as $30 per pound; large bodies of iron pyrites, the largest mica mine on the continent, and extensive bodies of iron ore.

Capital expended in careful investigation and development of the mineral resources of Southeastern Ontario would, it seems clear, reap a rich harvest.

*Abstract of paper read by Mr. W. J. Evans, of Belleville, Ont., before annual meeting of Canadian Mining Institute, Toronto, March 10, 1920.

THE COCOA AND CHOCOLATE INDUSTRY.

The Dominion Bureau of Statistics, Ottawa, has completed a preliminary report on the cocoa and chocolate industry in Canada during 1918. The report covers the operations of nine plants, Ontario and Quebec having four each, and Nova Scotia one. The total capital invested in the business was $3,694,339. The total cost value at the factory of materials used during the year was $3,835,479, of which $1,234,410 was for cocoa beans, $683,126 for sugar, $672,903 for cocoa butter, $235,895 for milk powder, $27,704 for flour, $22,949 for starch and glucose, $19,423 for fruits, $14,117 for essences and essential oils, $8,788 for spice materials, and $916,154 for all other materials. The quantity and selling value at the factory of all articles produced during the year was as follows:—Cocoa and chocolate, 15,322,499 pounds, with a selling value at factory of $4,670,699; spices, 43,802 pounds, with a selling value at factory of $15,499; miscellaneous products, $1,620,211, giving a total production value of $6,306,379.

CHEMICAL PATENTS*

By A. E. MacRAE

THE subject of chemical patents, and patents for products and processes relating to industrial chemistry, is one of the earliest in the realm of patents. As early as 1467 a patent was granted in Berne for the manufacture and sale of paper. During the ten years following 1561, when the patent policy of England began, twelve of the eighteen patents granted were for various chemical products and processes.

A patent is a form of monopoly, but is not a true monopoly. A monopoly in its strict sense is an exclusive right granted by the Sovereign or State to an individual or a number of persons of something which before was of common right. That is a true monopoly, and includes on the one hand an exclusive right or privilege, and on the other hand a restriction or restraint which operates to prevent the exercise of a right or liberty which was open to the public before the monopoly was granted. Thus, a patent for a new and useful invention never known or used before is not a true monopoly, because it does not restrict the exercise of a right that was open to the public before the patent was granted. Patents are frequently condemned by persons who do not recognize this fundamental difference between a true monopoly and a patent for a new and useful invention.

Patents Not an Exclusive Benefit.

Many people imagine that patent laws are for the exclusive benefit of inventors, and that a patent gives to the patentee a concession which he does not deserve, and this regrettable mistake leads to many misunderstandings. A man confers a distinct benefit by developing a patent, and he ought to be treated as a creator of public wealth. Compare the industrial development of such nations as England and the United States, which have liberal patent systems, with that of other countries where patent laws are less favorable to the inventor. Until comparatively recently Holland had no patent law whatever, and allowed the unrestricted use of any invention. It was easy to use freely in Holland processes patented in other countries and to distribute from there infringing goods to other countries of the world. Yet Holland with her highly developed commerce, her abundant money supply and enterprising people, remained industrially undeveloped. Why? Because there was no incentive to saddle one's self with the risks and outlays of starting a new enterprise or of improving methods for manufacture, knowing beforehand that in case of success one's neighbor could do the same thing without any restriction whatever. A patent is simply a contract between a nation and the individual. By the contract the inventor discloses to the public the results of his intellectual work. By doing so he enables others to get acquainted with his work and to improve thereon, and this stimulates further research, invention and enterprise. It is to be noted that newly disclosed patents are very frequently followed in rapid succession by improvements thereon conceived by others but patterned on the original invention. For the benefit thus conferred on the nation by the inventor, the nation in return gives him for a number of years the sole use of his invention. At the end of this term his invention becomes public property. The period of monopoly is none too long in view of the time it takes to develop the invention into commercial shape. In many cases inventions reach the money-making stage only after the patents on which they are based have expired.

A Limited Monopoly Granted.

The rights of the inventor to a limited monopoly of his invention is recognized by Canadian statute as early as 1824, and the first Canadian patent was granted in June of that year.

Section 7 of the Patent Act, Revised Statutes of Canada, 1906, says:

"Any person who has invented any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement in any art, machine, manufacture or composition of matter, which was not known or used by any other person before his invention thereof, and which has not been in public use or on sale with the consent or allowance of the inventor thereof, for more than one year previously to his application for patent therefor in Canada, may, on a petition to that effect, presented to the Commissioner and on compliance with the other requirements of this Act, obtain a patent granting to such person an exclusive property in such invention."

This Section thus provides that patents may be granted for four classes of things, namely—arts, machines, manufactures and compositions of matter and to be a proper subject for a patent they must each stand the test of invention, novelty and utility.

Processes come within the definition of arts and chemical patents are more particularly concerned with arts and compositions of matter. Processes are operations which consist particularly, or wholly, in the employment of some non-mechanical science, such as heat, electricity, light, chemistry, etc., or operations which consist entirely of mechanical transactions which may be performed by hand or by machine. Compositions of matter cover all compositions of two or more substances, whether they be the result of chemical union or of a mechanical mixture.

Patents are granted for things invented. A thing may be novel and useful, but unless it embodies invention, it is not patentable. Seabury C. Mastick, lecturing to the Chemical Engineering Class of Columbia University, spoke of invention in part as follows:

"'Invention' may be defined as the result of the exercise of something more than the expected skill of the average intelligent workman in the particular art to which the invention belongs.

"Some of the definitions of 'expected skill' are as follows:

"(a) It is but expected skill to substitute superior for inferior materials in making one or more or all of the parts of a machine or manufacture.

"However, it may or may not be more than mere expected skill to substitute one material for another, as an agent in performing a process, or as an ingredient of a composition of matter. The question in such case is to be

*Address delivered by Mr. A. E. MacRae, B.Sc., Examiner in the Chemical and Metallurgical Division of the Dominion Patent Office, Ottawa, before the Ottawa Branch, Society of Chemical Industry, February, 1920.

decided by some other rule than this of 'mere substitution of materials.'

"If the substitution of materials developed new properties and uses of the article made it may amount to more than mere expected skill, as in the substitution of vulcanized rubber for gutta-percha in the manufacture of plates for false teeth, where the Court found that the new product differed in kind from the art, having new uses and properties. Or in the substitution of hydrate of lime for powdered marble in a mixture with glue to form a material to restrain the too-rapid setting of plaster of Paris, the difference between the results accomplished being that between a partial and a complete success.

"(b) It is but expected skill to change the size or degree of a thing or of any feature or function of a machine or manufacture.

"For example, it has been held that grinding up flakes of glue into finely comminuted form was the exercise of mere expected skill, the Court saying in part:

" 'Mere additional convenience in packing the comminuted article, as compared with the flake glue, proves nothing to support the theory of the complainants, as the fact has been matter of common knowledge for centuries.'

"On the other hand, it may or may not require more than expected skill to change the degree of heat, or other agent, used in a process, or to change the amount of an ingredient used in a composition of matter. For example, it has been held that it was more than mere expected skill to produce a paper board formed from printed newspaper, ground to a pulp and having the permanent particles of the printers' ink minutely subdivided and uniformly distributed throughout the body of the board, the product differing from antecedent board in that it contained oils, commonly found in ink, which give to the board a toughness and elasticity theretofore unknown, and where in the prior art of making paper board from newspapers the effort was made to separate the carbon of the ink from the oil—the oil being taken out by alkali and bleaching, leaving the carbon for coloring matter—the Court saying:

" 'It is manifest that in practical operation, under the process mentioned in the patent in suit, the oils cannot be entirely retained, a small portion will be lost in the boiling and heating process, calculated to minutely subdivide and distribute the oils throughout the fibres. It is manifest, also, that in the process employed in the previous art, a small portion of the oils was not eliminated; no amount of boiling or bleaching could completely purify the pulp. But in the process under the patent the purpose is to lose as little as possible; in the previous art, the purpose was to eliminate as much as possible. The processes are in purpose and in effect, so far as is practicable, the opposites of each other. And though the purpose of each partially fails, the results are so widely different that both the process and the paper board are commercially distinct.'

"A classic exception to the rule that change in size is but the result of the exercise of expected skill is found in the case of the Edison incandescent light patent, where the reduction of the diameter of the filament from 1/32 of an inch to 1/64 increased the resistance fourfold and reduced the radiating surface twofold, thus increasing eightfold the ratio of resistance to radiating surface and permitting the use of electricity of comparatively high electromotive force and comparatively low current, instead of contrariwise.

"(c) It is but expected skill to omit one or more of the parts of a machine or manufacture with a corresponding omission of function unless that omission causes a new mode of operation of the parts retained.

"(d) It is but expected skill to change a process, machine, manufacture or composition of matter, by substituting an equivalent for either of its parts, unless the new part not only performs the function of the part for which it was substituted, but also performs another function, by another mode of operation, or develops new uses and properties of the article formed.

"An equivalent has been defined as a thing which works in substantially the same way to accomplish the same result or perform the same function as the thing for which it was substituted.

"As an example of what has been held to be an equivalent and the substitution of which is therefore the result of the exercise of mere expected skill, attention is called to the case where it had been disclosed in the art of forming plates of secondary electric batteries that peroxide of lead (PbO_2) was the best oxide of lead to use in the preparation of the plates and the patent claimed the use of red lead or minimum (Pb_3O_4). The Court held that 'after the invention of a support primarily quoted with mechanically applied oxide of lead (such as peroxide of lead), merely quoting the plate with the commonest, cheapest and best known form of lead oxide did not require the exercise of the inventive faculties. . . . It would seem that the use of red lead would at once occur to anyone who even has a superficial knowledge of the art.' It was shown, also, that the results obtained by using the red lead were not as good as those when the peroxide was used.

"(e) It is but expected skill to use an old process, machine, manufacture, or composition of matter for a new and analogous purpose.

"For example, in the manufacture of hydrogen peroxide by the addition of a solution of barium peroxide to a suitable diluted acid, such as sulphuric, where the reaction had been facilitated by stirring by hand, it is held to be mere expected skill to adapt a mechanically driven screw having helicoidal blades to perform the stirring.

"(f) It is but expected skill to change the form or proportions of a machine or manufacture, unless some new mode of operation or function results.

"But it is more than the exercise of mere expected skill to change the proportions of the ingredients of a chemical combination, or other composition of matter, where a new product having new properties results.

"For example, Charles Goodyear invented soft vulcanized rubber consisting of crude India rubber and sulphur in the proportion of one part of sulphur to five parts of rubber; and afterwards Nelson Goodyear invented hard vulcanized rubber, consisting of equal, or substantially equal, proportions of sulphur and rubber. Here the change in proportion resulted in two entirely distinct articles, having entirely distinct modes of operation and functions and the latter was held to be patentable."

Review of Prior Work Necessary.

To be a proper subject for patent the subject matter must stand the test of novelty and utility as well as of invention. We have seen that a thing may be new, but not be an invention. It cannot be an invention without being new. In his Petition, an applicant for a patent in Canada, states that the subject matter of his application was not known or used by any other person before his invention thereof, and was not in public use or on sale

with his consent or allowance for more than one year previous to his application for patent therefor in Canada. Novelty is thus determined by reference to the prior art as disclosed in patents or other printed publications or in public use or practice. Prior knowledge or use is not to be considered unless disclosed in printed publications prior to the making of the invention or more than one year prior to the application for patent for the invention. Moreover, the information disclosed in the printed publication must be full and precise enough to enable one skilled in the particular art to perform the process or make the article sought to be anticipated before it may be considered.

Inventors have expended much time and thought in developing processes which, as far as they knew, were quite novel, only to find on applying for a patent that someone else had previously worked the same process. This may be a hardship on such inventors, but the Act refuses them a patent. This emphasizes the need for careful review of the prior art before undertaking research in any particular art. A slight degree of utility is sufficient to meet the requirement of usefulness. An invention which has an illicit object in view is not patentable, however.

United Kingdom Restrictions.

In the present Canadian Act, there is no restriction on the nature of the composition of matter which may be patented, except that it must be new and useful and the result of invention. The same conditions exist in the United States and did exist in Great Britain until a very recent date, when a new Patent and Design Bill, which was introduced in the British House of Commons, in November, 1917, became law. This Bill passed the House of Commons without debate, discussion or division, and by it, I understand, products of chemical processes or intended for food or for medicinal or surgical purposes may not be claimed in a patent application, but only the process. That is, specification relating to an article or substance made by chemical processes or intended for medicinal or surgical use may contain claims for the process of manufacture only and not for the substance or composition of matter. Some other countries also refuse patent protection on similar compositions. Germany, Austria, Japan and Russia refuse to grant patents on foods, medicines, or chemical products, and in Switzerland neither the product nor the process of making them may be patented. Sweden will patent processes of making foods or medicines, but not the product. Denmark will not patent medicines, articles of food, nor processes of making articles of food. France, Italy and Spain refuse patents on medicines and pharmaceutical preparations of all kinds.

Kinds of Compositions.

The intermixture of the ingredients of a composition of matter may be by mechanical or chemical operations, or both, and to be patentable the composition must possess characteristics or properties not posssed by any of the individual ingredients. The mere presence of a new ingredient in a composition does not give patentability unless it changes the essential characteristics of the composition. Alloys are a good example of the various kinds of compositions, as they may vary all the way from a true chemical compound to a mechanical mixture of two or more metals. Examples of true organic chemical compounds are found in the following claims taken from recent Canadian patents:

(1) Dimethyl-diisopropyl-benzidene.

(2) A new dyestuff consisting of the tetrazo compound of dimethyl diisopropyl benzidene coupled with an amino aromatic compound.

(3) Amyl ether of cephaeline.

Processes.

A process is a way of treating substances to produce a desired result, and it may consist of one or more steps to reduce or change the substance to the desired state, it may be performed irrespective of any particular form of mechanical device. A chemical process is patentable, but a process merely involving the function or principle of a particular mechanism may not be patentable. A scientific principle of itself is not patentable, but its application to a particular process may be the subject of a patentable invention. One may discover a natural force or scientific fact, but he is entitled to patent protection only on the process by which he makes use of the effect of the natural force. For example, the fact that heat will decompose substances cannot be patented, but its application to the manufacture of lime from limestone might be patentable if new. That is, the specific application of the principle is patentable.

Applying for a Canadian Patent.

An application for patent in Canada consists of a Petition, an Oath and a specification, and if the nature of the invention admits of illustration by means of drawings, such drawings must be submitted. The specification embodies a preamble, giving the name and residence of the inventor and the title of his invention, a general statement of the objects and nature of the invention, a brief description of the figures of drawings, if there be any, a detailed description of the invention and the claim or claims. The specification should fully and clearly disclose the principle of the invention and the preferred way in which the applicant intends applying the principle, in such a way as to distinguish it from other inventions. In chemical cases, the terms used should be sufficiently definite to enable one skilled in the art to know precisely what is to be included. The claims should point out with definiteness and distinctness the invention and should not be couched in a great variety of expressions with a view to catch infringers who may hereafter use modifications of the invention.

Two copies of the specification, three copies of claims and two copies of the drawings on tracing linen and one on bristol board are required. The original copy of the specification, claims and drawings remain on file in the Patent Office. The duplicate is mailed as the Patent. The third copy of claims is used for printing the Patent Office Record and the drawings on bristol board, together with a printed copy of the claims from the Record are filed in the examiner's room for searching purposes.

The duration of a Canadian Patent is eighteen years. The full fee is $60, but it is the applicant's option to pay the full fee for the term of eighteen years or the partial fee for the term of six years or the partial fee for the term of twelve years. Whenever a patent is deemed defective or inoperative, by reason of insufficient description or specification, or by reason of the patentee claiming more than he had right to claim as new, but at the same time it appears that the error arose from inadvertent accident or mistake, the patent may be surrendered and a new patent issued for the unexpired term of the original patent

upon the payment of four dollars for every unexpired year of the duration of the original patent.

In order to maintain a Canadian Patent valid, the patentee must, at the end of two years from the date of the patent, commence and constantly carry on in Canada the construction or manufacture of the patented invention, in such a manner that any person desiring to use it may obtain it or cause it to be made for him at a reasonable price. Moreover, the patentee must not import the invention into Canada after twelve months from the date of the patent. The Commissioner of Patents may, however, if sufficient reason is shown therefor, extend the period of non-manufacture in Canada or the period of one year for importation into Canada.

An applicant may, prior to the issue of his patent, or within six months thereafter, apply to the Commissioner of Patents to have the Compulsory License clause substituted for the above mentioned conditions of manufacture, and the Commissioner having regard to the nature of the invention may grant such request. That is, under this clause any person at any time during the life of the patent may apply to the Commissioner of Patents for a License to use the invention, and the Commissioner being satisfied that the reasonable requirements of the public with reference to the invention have not been satisfied, may order that a license be granted to the person applying therefor upon such terms as the Commissioner may consider just.

An inventor who has not perfected his invention may file in the Patent Office a Caveat, embodying a description of his invention. If at any time within a year of the filing date of the Caveat another person applies for a patent covering the same invention, the person filing the Caveat will be notified thereof and given three months within which to file his application for patent. If the applications are found to be conflicting, they are declared in interference. A Caveat gives no protection, but it affords one reasonable assurance that a patent covering the invention disclosed will not be granted within a period of one year from the date of filing the Caveat without his being notified.

When an application is received in the Patent Office it is given a filing date and a serial number. The formal papers and the copies of the specification and claims are compared and the application is referred to the examiner who deals with the art to which the alleged invention belongs. It is the examiner's duty to see that the specification properly discloses the nature of the alleged invention and to determine whether or not the subject matter discloses an invention which is useful. As previously stated, the presence of invention and novelty is determined by a search of the prior art. The extent of the search is necessarily somewhat limited as the facilities for searching in the office include only Canadian Patents, the United States Patents for a short period, and a somewhat incomplete set of British Patents, together with some of the technical journals. The examiner reports to the applicant any informality in or objections to the specification or claims, as well as references to the prior art held to anticipate any or all of the claims. The applicant may amend as often as any objections or references are presented, and in doing so should point out wherein he thinks his case presents patentable novelty in view of the art disclosed. When the application is found to properly define the scope of the invention, it is allowed and issued as a patent. Patents are dated and mailed approximately six weeks after allowance. The length of time an application is held awaiting action by the Patent Office is dependent on the condition of the examiner's work. Many of the examiners ableioU.si cmfwyp hrdlu fwyp hrdlu fwyp fwyp fwypoio at the present time are several months behind with their work, owing to the increased number of applications for patents and to some extent to the depletion of the examining staff during the war.

A comparatively large number of applications never mature into patents, as they are found not to embody invention. When an examiner refuses to allow an application, the applicant may appeal from the examiner's decision to the Commissioner of Patents, who may allow the application, if he finds that in his opinion the examiner was in error in refusing to allow the case. An appeal may be taken from the decision of the Commissioner of Patents to the Exchequer Court. In the case of two or more applicants claiming the same invention, the applications are held to be in conflict, and the original inventor is determined by arbitration and the patent granted to the one so determined.

The Patent Office Record is published weekly and contains from one to three of the claims of such patent with the main figure of the drawings. The complete specifications of patents are not printed, but may be obtained from the Patent Office in typewritten form with a photograph of the drawings.

Patents are of such vital importance to industry that everyone interested in the industrial development of Canada should strive to improve the Canadian Patent System. The new British Patent and Design Bill is of particular interest to chemists, as it greatly affects patent protection which they may secure on their invention in Britain. I would urge on Canadian chemists to study the question of patents on chemical products in order that they may be in a position to express their views on this subject in the event of such an amendment to the Canadian Patent Act being proposed.

BASIC SLAG COMPARED WITH ACID PHOSPHATE.

Tests comparing basic slag and acid phosphate as fertilizers, conducted at the Ohio Experimental Station, Wooster, would seem to show that basic slag should not be purchased in preference to acid phosphate when the cost of the fertilizing unit is greater in the slag than the acid goods.

This statement is based upon long time tests both made at the Experiment Station, Wooster, and the sub-station at Strongville, Cuyahoga county, says the Ohio Experiment Station Bulletin.

On limed land at both places the phosphoric acid in acid phosphate has given larger gains than in basic slag. Seventeen per cent basic slag would carry 60 pounds more phosphoric acid to the ton than 14 per cent acid phosphate, but as a 25-year average of four comparisons with corn at $1 a bushel, oats at 75 cents, wheat at $2 and hay at $20 a ton, the value of the increase from a ton of 14 per cent acid phosphate has been $31.80, and that from a ton of 17 per cent basic slag has been $31.84.

MONSANTO ENLARGE PLANT.

At a cost of about $750,000, the Monsanto Chemical Company, St. Louis, is erecting a new group of factory buildings on Falling Spring Road near the city line of East St. Louis, Ill. The work is now well under way and fast nearing completion.

Canadian Cyanide: Its Manufacture and Utilization*

By W. S. LANDIS

THE alkali cyanides play a very important part in the extraction of the precious metals from their ores. In addition to the recovery of precious metals, cyanides also find a very considerable application in the chemical industry for the production of ferrocyanide, in the dye industry, in electroplating, in case-hardening of steel, in fluxing powders and in fumigation. The mining industry must compete in the open market with all these industries for its supply of this reagent.

Older Commercial Processes.

Up to 1917 there were only two well-defined and developed processes for the production of alkali cyanides. The most important of these is the Castner Process, in which the raw materials used consist of metallic sodium, ammonia and wood charcoal. The reaction takes place in three stages, in the first of which dry ammonia gas is conducted over metallic sodium to form soda amide. The soda amide is next heated with charcoal to form sodium cyanamide. Sodium cyanamide is again heated with additional charcoal to form sodium cyanide. The resulting product is obtained in a melted form and of a commercial purity averaging 96-98 per cent. for the higher grade products. Metallic sodium is made by the electrolysis of caustic soda or of sodium chloride. It is a comparatively expensive reagent, and at the present state of development of the art there is comparatively little opportunity offered for a materially cheapening of the sodium. Ammonia is obtained in the form of a fairly pure solution in water, either from the coke ovens, gas plants or cyanamid works. Its price to-day is very high, owing to certain economic conditions now existing, but perhaps in the future there is a possibility of obtaining cheaper ammonia than at the present time. Nevertheless, even at the lowest price ammonia has been sold, it may be looked upon as an expensive reagent.

This process has never been installed in Canada, but has furnished much of the product used in the Dominion, either from representative plants in Great Britain, the United States or Germany.

The second commercial process uses as its raw material the vinasse produced as a residue in beet sugar manufacture. By distilling this material and treating the vapors obtained, hydrocyanic acid is produced, which can be absorbed in caustic soda solution and the cyanide recovered therefrom. The process is complex and requires very exacting chemical control. The recovery of cyanide from solutions is a very difficult manufacturing problem, and as a result its operation has never been developed outside of Germany, and it only competes in a small measure with production by the Castner Process.

Before 1917 Canada never played any part in the production of a reagent which the precious metal industry of the Dominion consumed in large quantities, but had been entirely dependent upon importation. The processes hitherto employed had either used expensive raw materials or had been complicated in character, and the price of cyanide to the Canadian consumer had of necessity been fairly high.

The recent great war seriously affected the supply of cyanide to a great many mining districts. The production of the large German plants was excluded from commerce. The great demands for electric power, caustic soda and ammonia, occasioned by the manufacture of munitions, interfered greatly with the production of some of the other plants outside of Germany. As a result, in the fall of 1916 the price of cyanide began to mount to almost unbelievable figures. The visible supply almost disappeared. It is not necessary to go into detail on this subject, as the mill man is only too familiar with the conditions then existing.

Development of Canadian-Made Cyanide.

It had been known for many years that calcium cyanamid could be transformed into cyanide, but no commercially workable process had been developed in the fifteen years intervening since this fact had first been discovered in the laboratory. Serious attempts had been made at the development, but the difficulties of inefficient transformation, of costly furnace operation and maintenance, and finally, of the utilization of a product containing only a low percentage of cyanide, all had prevented this transformation from becoming a commercial possibility.

In the fall of 1916 the cyanide situation became so acute that a large mining corporation with headquarters in the United States interested the American Cyanamid Company in undertaking serious development work at the Cyanamid plant at Niagara Falls, Canada, with the object of devising a process of producing cyanide from cyanamid. The problem had been comprehensively studied some years before, the officials of the Cyanamid Company having visited the principal plants abroad where work of this nature had been done, and had there familiarized themselves with the difficulties involved in making this transformation. They found no operating plants or processes that could be given consideration, and were practically forced to start with the very fundamentals of the process. Plans were completed for an experimental installation at Niagara Falls, Canada, and the first units were put into operation about January 1, 1917.

Cyanamid is a nitrogenous material containing calcium cyanamid, $CaCN_2$; calcium oxide, CaO; graphitic carbon, C; and various minor impurities obtained from the raw materials used in its production. Its principal use has been in the fertilizer industry, where the nitrogen of the cyanamid, through soil transformation, becomes available for feeding crops, and is therefore competitive with other nitrogenous fertilizer materials. It is one of the cheapest sources of combined nitrogen known, and from this fact of its cheapness it offers an admirable material for transformation into cyanide.

Process Used at Niagara Falls.

The process, as ultimately worked out, involves mixing of cyanamid and common salt together and melting the mixture in a peculiar type of single-phase electric furnace. The operation is continuous and largely mechanical, and the power requirements for this melting process

*Paper presented by W. S. Landis, of the American Cyanamid Company at the Canadian Mining Institute, March 9th, 1920.

are very moderate. Temperatures are not high, and wear and tear on the apparatus is not excessive.

The furnace is tapped continuously, and the molten product runs to a cooling device which instantly chills it in the form of thin flat flakes of a dark grey to glossy black color and extremely brittle. These flakes are packed into caustic soda drums and shipped to the consumer.

In the early experimental work it was hoped to obtain a product containing about 12 per cent. equivalent sodium cyanide content, the remainder being lime, common salt and miscellaneous minor impurities. The first experimental processes, which operated on the batch principle, amply met expectations both as to quality and output. As developments proceeded and more was learned of the characteristics of the product, the quality improved, and by the end of 1917 a product was being turned out containing about 22 per cent. of equivalent sodium cyanide to the extent of about four tons of sodium cyanide (calculated as 100 per cent.) per day. In 1918 the developments were continued, and the batch furnace was abandoned for a continuous type, and by the end of that year was producing a material containing approximately 30 per cent. equivalent sodium cyanide.

Developing the Process.

In July, 1919, after a temporary shutdown of the operation, developments were again taken up in a serious attempt to improve the quality of the product and cheapen its cost of manufacture. These developments were the most remarkable of all attempted, and inside of a few weeks a product of very uniform quality was being produced, averaging between 36 and 37 per cent. equivalent sodium cyanide. The demands for the material increased so enormously, due to the improved quality of this product and the increased uses found for it, that experimental work was halted for a short time to catch up with the orders on hand. It was later again taken up, and towards the end of the year 1919 the quality of product was again improved, and several hundred tons of material, running about 46 per cent. equivalent sodium cyanide, being produced.

The demands for these improved products—the 36 per cent. grade being known as Aero Brand Cyanide Grade X, and the product above 45 per cent. known as Aero Brand Cyanide Grade XX—have recently become so great that additional equipment is now going into operation in the plant at Niagara Falls, Canada, to assist in meeting a demand of nearly thirty million pounds of sodium cyanide (calculated as 100 per cent.) for the year 1920.

Properties of Canadian-Made Cyanide.

The product consists of a dark grey to black shiny material in the form of thin scales, varying from 1-16 to 1-32 of an inch in thickness, and from ¼ to ½ square inch in area. The old system of designating this material in expressing its content of available cyanogen in the form of either potassium cyanide or sodium cyanide has been preserved, and, as before mentioned, two grades are on the market, one known as Aero Brand Cyanide Grade X, containing 36-37 per cent. equivalent sodium cyanide, and the other known as Aero Brand Cyanide Grade XX, containing above 45 per cent. equivalent sodium cyanide. Future developments will undoubtedly allow the production of a still more concentrated cyanide, and we hopefully anticipate being in a position to supply a product containing over 50 per cent. equivalent sodium cyanide by the time the demand for that grade arises. Both grades are sold on basis of contained equivalent of sodium cyanide.

Besides the available cyanogen the product also contains free lime, sodium chloride, and various impurities in small amounts, such as cyanamid, miscellaneous calcium compounds, and such impurities as are picked up in the ash of the coke used in the cyanamid process. The sum total of these various miscellaneous compounds is only a few per cent., and none of them have ever caused any deleterious action in the proper usage of the material.

Aero Brand Cyanide, like all other cyanides, undergoes decomposition on contact with moist air, carbon dioxide and water. It is therefore packed in tight metal containers, for which purpose the ordinary iron caustic soda drum is used. The standard package contains about 375 pounds, and is marked to show the character of its contents and the grade of the material contained therein. If kept tightly closed the contents keep indefinitely, but if moisture is permitted to enter the drum, or the material is exposed in a pile to the air, decomposition will occur and a loss of cyanide will be noted. The flakey nature, that is, the large exposed surfaces of the product, show the effect of such exposure to a greater extent than the ordinary flat slabs of the usual and higher grade cyanides found on the market.

Aero Brand Cyanide when dumped into water dissolves readily in so far as its soluble constituents are concerned. Care must be taken to thoroughly agitate during solution, as otherwise the flakes will sink to the bottom of a dissolving tank. The lime present will hydrate with a considerable local evolution of heat, and the mass of damp flakes will then decompose, due to the high temperature in the presence of moisture, and the wet mass will give off ammonia with consequent loss of cyanogen. It is therefore necessary in dissolving this material in mill solutions that agitation be thorough, and all settlement and accumulation be prevented. If this precaution is taken, very quick solution of the soluble contents follow, without loss of cyanide.

Cyanamid contains a small amount of calcium carbide. At times additional carbide in very small amounts is added to the cyanide furnace. As a result, Aero Brand Cyanide contains upwards of one per cent of calcium carbide and when thrown into solution evolves acetylene gas. The quantity of gas evolved is quite small and no difficulty has been experienced from handling it, but its odor is quite noticeable. It is, however, a non-poisonous gas and little attention need be paid to its odor. It is recommended, however, that ventilation of the mill buildings be so provided that this gas can be carried out of the building and not permitted to accumulate there to any marked degree.

In handling Aero Brand Cyanide in mills, the usual practice is to cut out the top of the drum, which can easily be done, as the metal is very soft. This can is then dumped into the mill circuit. Many malicious reports have been circulated throughout the mining regions to the effect that the opening of these cans was a hazardous operation, as they evolved very poisonous gases. No fatalities, so far as known, have ever occurred in the handling of these drums, although there are customers who have used thousands of tons of the material in the three years of its manufacture, and there has been quite freely placed at our disposal undisputed evidence contradicting the malicious reports.

As mentioned above, the soluble constituents of Aero Brand Cyanide dissolve very readily in water. There is a

certain amount of insoluble material consisting of lime, graphitic carbon residue and various minor impurities that will not go into solution. It was anticipated that this carbonaceous residue might give trouble in the mill circuit causing precipitation of the precious metals. In the first few months of the use of Aero Brand Cyanide this insoluble residue was filtered out and only clear solutions fed to the treatment tanks. It was quickly learned, however, that the residue did not have any precipitating effect on the precious metals in the solution, and the practice of filtration was therefore abandoned. The present universal procedure is to dump the cyanide directly into the agitation tanks or at any other suitable place in the mill circuit without special filtration. It, however, must not be dumped into the pregnant mill solution as the calcium carbide it contains evolves acetylene on contact with water and acetylene will precipitate gold and silver. Since this gas is instantly set free on touching water and no trace remains in solution where a thorough agitation exists, no difficulties whatever are experienced from this source, provided the addition has not been made to a solution carrying appreciable quantities of gold and silver.

Mill Experiences.

The most extensive test of Aero Brand Cyanide, in which careful records were kept of its performances in the mills, was in Mexico. It was introduced into two mills treating very different ores, and after two and a half years of experience, a very comprehensive report covering its behavior was submitted by the operating company. At first it was shoveled into a small tube-mill and ground in order to get it into solution, and the solution was filtered. This filtering was later abandoned and, instead, lead oxide added. Finally the regular Aero Brand Cyanide was fed, along with pulp, into the large tube-mills regularly employed for grinding the ores and no additions were made. The report states that in both mills the recoveries were equal to those obtained from 98 per cent. sodium cyanide. There was no change in respect to zinc consumption nor in the grade of bullion produced. The lime in the Aero Brand Cyanide was valuable to the extent that it was available, but a change in the character of the ores received at the mills did not enable definite conclusions as to whether there was any ultimate actual saving in lime. In every case Aero Brand Cyanide was just as effective as the 98 per cent. cyanide up to the extent of its actual cyanide content.

The only actual difficulty experienced in this connection was due to an unusual condition arising in that at one time the mill solutions were increased in concentration to about 1 per cent. KCN. Since the only solution run to waste in this mill was a small amount not washed out of the slime cake there was a decided increase in the concentration of the chlorides found in Aero Brand Cyanide in the mill circuit. This prevented lime going into solution and reduced the protective alkalinity. However, since this report was prepared the quality of Aero Brand Cyanide has been very materially improved and the quantity of chlorides correspondingly reduced.

Aero Brand Cyanide has been in extended use in the silver districts of Ontario. Many carloads of both Grade X and Grade XX have been used in this district with excellent results. The same difficulty of concentration of the chlorides have been experienced in this Ontario district as were noted in the high-grade mill in Mexico, but the difficulty was very quickly cleared up through the addition of a precipitating agent which dropped out the lime and permitted it to be separated on the slime filters. This is a peculiar condition arising from the very high cyanide consumptions met with in the treatment of these silver ores and is not found in any other of the districts which I will mention later on.

Before introduction into the Ontario district an extensive series of tests was undertaken, in which Aero Brand Cyanide was compared with the 98 per cent. product heretofore used in that district. Cyanide consumptions were somewhat lower for Aero Brand than for the 98 per cent. product and extractions were equally as good, at least as far as indicated by the precision with which the assays were carried out. As a result of these tests, including one conducted by Haileybury School of Mines, its adoption by operators in the Cobalt district followed, and they have now been using Aero Brand Cyanide many months with very successful results.

Following the introductory sales, repeat orders for carload quantities have been received from mills in California, Colorado and Nebraska, in addition to the districts mentioned above. In the case of a Nevada mill a very extended series of tests on mill scale were run, comparing Aero Brand Cyanide with the ordinary 96-98 per cent. sodium cyanide. The extraction and consumption records from Aero Brand were quite as good as obtained with the more expensive competitive product. A second and more extensive test followed and confirmed the earlier results, and this mill is numbered among our most enthusiastic customers.

Extensive shipments have also been made to mills in Arizona, Montana, Oregon and South Dakota. These carload quantities were only ordered after a thorough investigation and in some cases laboratory test, and in no case has a question arisen as to the satisfactory behavior of the product. Without exception, wherever a mill scale test of Aero Brand Cyanide has been carried out, it has been adopted.

The mining industry is not the only large consumer of Aero Brand Cyanide, for it has made remarkable progress in the fumigation of citrus trees. A plant was designed nearly a year ago to produce liquid hydrocyanic acid from this product, which plant started to operate in July, 1919. It has operated to capacity ever since, and a very much larger plant is now under construction to meet next season's demand for this product. The high quality and very pure liquid made from Aero Brand Cyanide has resulted in a very quick establishment of the material with California citrus growers.

Conclusions.

Canada to-day possesses a cyanide manufacturing industry which in three years has so grown and expanded that it is supplying the bulk of the cyanide consumed in the mining and fumigating industries of the United States, and will shortly lead in the Canadian and Mexican fields.

The product, Aero Brand Cyanide, is made of raw materials, the production of which are under control of the manufacturing company, or are easily obtainable in the open market. They are very cheap in comparison with those used in the Castner Process. For example, common salt is available in the Niagara district on either the Canadian or American sides, and the cheapest form of rock salt may be used. Cyanide is a fertilizer material and is probably the cheapest source of fixed nitrogen to-day. It has always sold in competition with nitrogenous fertilizers of like character. These conditions insure a most reliable source of supply of this Canadian product.

Electricity in the Rubber Industry*

By C. W. DRAKE

IT is extremely doubtful if there is another industry which can show as rapid growth during the past year, and one with as great a projected development, as the rubber industry. From casual observation it might appear that the automobile and truck factories were expanding as rapidly, but it is readily seen that the tire industry must not only supply tires for all new equipment, but must also supply at least one set per year for all existing cars. In 1919 the auto registration in the United States was approximately,7,000,000 and in Canada 325,000, which indicates, in a general way, the number of tires that will be required for maintenance only.

From a power standpoint, tire plants are also unique in the large amount of power consumed per machine and per employee. Approximately one h.p. of motor capacity is required for each tire manufactured per day, or, in other words, a plant manufacturing 4,000 tires per day would have approximately 4,000 h.p. in motor h.p. installed. The smallest plant with one calender equipment has from 300 to 400 h.p. installed, and a demand of 200 k.w. or over. A planing mill, machine shop or other industry would be considered a large plant and would require a large floor space if it had such a power-demand.

High Load and Power Factors for Rubber Plants.

A load of this nature is very desirable from the power companies' point of view, on account of the high load factor and also high power factor that may be obtained. The load factor based on a 24-hour day will vary from 60 to 75 per cent. for plants working three shifts, while for plants working only one shift, it will vary from 20 to 30 per cent. The power factor should not be below 80 per cent., as most of the motors are large, and also as a part of the load (the direct current supply) consists of synchronous apparatus. The power factor of plants using 25-cycle equipment will also be higher than plants using 60-cycle apparatus. In laying out new plants, the frequency is generally determined by the power supply available, but 25 and 60 cycles are equally satisfactory. Somewhat better performance may be obtained on 25-cycle motors, but the cost of a complete 25-cycle installation will be higher than for 60 cycles. For motors of approximately 100 h.p. and larger, 2,200 volts is favored on account of the saving which may be effected in the wiring, switch gear, and often in reduction of transformer capacity. For the smaller motors the voltage will depend principally upon local practice, which, in Canada, favors 550 volts, and in the United States either 220 or 440 volts. There is much to be said in favor of 550 volts, but the choice depends principally on the apparatus which is carried locally in stock.

Of the total horse-power connected in an average tire plant, approximately 80 per cent. of the capacity will be installed on mill and washer lines, 10 per cent. on calenders, and 10 per cent. on miscellaneous machines. Hence a discussion of electric drives for rubber mill machinery will naturally reduce to a discussion of various types and forms of drives for mills and calenders.

Mill Line Drives.

As in other industries which have been converted from steam to electric drive, it is found here that many of the earlier drives consist principally in the replacement of the engine by a motor of suitable capacity and connected by some standard method of transmission. All of the early machine tool drives made use of machines designed for belt drive, and it was not until the machine tools were especially designed and constructed for motor drive that the greatest advantages could be obtained. Mill lines driven by steam engines operated at slow speed, generally from 70 to 100 R.P.M., while in England speeds of 40 to 60 R.P.M. were common. The heavy flywheels necessary for satisfactory operation of the engines were often left on the mill lines, and there was considerable discussion at first regarding their use on motor-driven mills. Flywheels are useful only for loads of a few seconds' duration, while peak loads on rubber mills may last for several minutes. Also, to give up much energy a large drop in speed is required, and a motor such as used on mill lines, with an increase in load from full to 100 per cent. overload, would slow down only 3 or 4 per cent. Theory and practice have both shown that flywheels are unnecessary, and sometimes even a detriment for this application.

Until quite recently practically all motors driving mill lines were of the induction type, that is, either squirrel-cage or slip-ring. These motors operated at speeds from 400 to 600 R.P.M., and were connected to the mill lines by various types of gear reduction, chains or even belts being used in some cases. Although squirrel-cage motors have low-starting torque and high-starting currents as compared with high-starting torque and low-starting current of the slip-ring motor, numerous squirrel-cage motors are in use. As a rule, if squirrel-cage motors are installed, some form of clutch is used so that the load may be thrown on after the motor is running at full speed, while with the slip-ring motor no clutch is required in order to start the load. But there is another point to consider, namely, the quick stopping of the mills in case of accident. In the old drives this was accomplished by the individual jaw clutches on the line shaft. The mills have practically no flywheel effect, and stop as soon as released. A mill line driven by a motor has a large flywheel effect, most of which is in the rotor of the motor, some in the gear reduction, and a small amount in the mill line. Consequently, to obtain the quickest stop with the least braking effort, magnetic clutch brakes have been extensively used. In stopping, these disconnect the motor from the load and brake on the mill side. The clutch also makes it possible to start the motor light, but if slip-ring motors are used, the clutch may be closed first and the load started by means of the motor, thus reducing wear and maintenance of the clutch. It is entirely possible to design brakes which will stop both the motor and the line, but these are generally plain mechanical brakes, electrically tripped, and the tripping circuit is so connected with the motor control that the motor circuit is opened and the brake applied at the same time. The use of such a mechanical brake makes it possible to couple the motor to the gear reduction without any friction device.

Another method of stopping the entire mill line is by "plugging" the motor, and as quick a stop may be obtained in this manner as is desired. With squirrel-cage motors

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"plugging" is accomplished by connecting the motor to a reduced voltage or starting tap with one phase reversed. With slip-ring motors one primary phase is reversed and secondary resistance is inserted to limit the current to any desired value. With any system of "plugging" an automatic control is required, and also some form of mechanical device which opens the control circuit when the motor stops and prevents it from reversing. It is also entirely feasible to stop any induction motor by applying a suitable direct-current voltage to the terminals, but this complicates the control by introducing direct current, and some means is also required for automatically disconnecting the direct current circuit after the motor has stopped.

Synchronous Motors for Mill-Line Drive.

During the last few years an increasing amount of attention has been given to the question of plant power factor, due to the very detrimental effect of low power factor on transformers, lines and generating capacity. With a view of increasing the existing power factor many of the larger plants are using, or considering the use of synchronous motors for mill-line drive. The starting characteristics of synchronous motors are worse than those of squirrel-cage induction motors, so that for mill-line drives it is always necessary to start the motor light and throw the load on by means of a clutch. So, from a mechanical standpoint, a synchronous motor may be used to replace any induction motor, using a clutch for starting, and this motor may be designed to carry full load, either at 100 per cent. power factor, or at a leading power factor of, for instance, 80 per cent. But, besides high power factor, synchronous motors offer other possibilities not obtainable with induction motors. Synchronous motors in capacities of 300 h.p. or over may be built for extremely low speed, such as 100 to 120 R.P.M., and yet give high efficiency at a reasonable cost. Both the price and performance of induction motors for these speeds would be prohibitive, but the synchronous motor thus makes it possible to eliminate gear reduction and couple the motors to the mill line. Mill-line speeds for new layouts now run as high as 120 or 130 R.P.M., and it is entirely possible that within a few years changes in mill design may make it possible to use shaft speeds of 200 R.P.M. or over. This will make a marked reduction in the cost of the motors, also in the clutches.

Power Requirements of Mill Lines.

Although there have been many formula and rules for estimating the horse-power required for various sizes of mills and combinations of mills, tests and experience now show that these are not very reliable. Tests have shown that in the same mill one stock may take twice as much power as another, and besides this, there are other variables, such as delivery speed, friction ratio, pounds of charge per inch of face, number of mills on the line, etc., which have a bearing on the power required. However, records have been obtained which show that the maximum instantaneous peaks may be as high as 3.5 h.p. per inch of roll face. In other words, on a mill line consisting of five 60-inch mills, or 300 inches total, if the maximum load occurred on all mills simultaneously, the total peak would be about 1,050 h.p. If a 400 h.p. motor were used on this line the maximum load would be about 2.5 times the full load rating, but represents a pull-out torque, not difficult to obtain, espeially on 25-cycle, 500 R.P.M. motors. As the torques of induction motors vary inversely with the square of the voltage, it is important in laying out mill-line drives to see that there is ample transformer capacity and ample wiring, so that overloads of 100 per cent. may be carried without a serious drop in voltage. A 10 per cent. drop in voltage would reduce the maximum torque of an induction motor from 3 to 2.4 times full load torques.

Control for Mill-Line Motors.

Controllers may be classified as manual or automatic, but both may provide the same protection to the motor, as regards low voltage and overload. In order to carry high instantaneous overloads, relays with inverse time elements are used which will carry the overload for a short period, but open on a continued overload. For mill-line service, controllers should provide for reversing in case of emergency, which on low voltage motors may be done by double-throw knife switches, and on high-voltage motors by a double-throw oil breaker, or combination of breakers. The manually-operated controller must be mounted within sight of the motor, and the starting or acceleration of the motor is dependent upon the operator. The automatic control may be located in any desired position, and the acceleration is independent of the operator. Due to the congestion of machines in some of the larger plants, and the rather poor class of labor obtainable, the automatic control is gaining favor on account of the saving in floor space affected, also the added protection to the machinery.

Calender Motors.

Both alternating-current and direct-current motors are used for driving calenders, but the limitations of the alternating-current drive are well known. The more common alternating-current drive consists of a slip-ring motor with resistance control, and if geared to give a high maximum calender speed, the regulation at half speed, or below, is very poor. In other words, the production is limited by the range in speed possible, and the regulation at low speed. Also, no simple method of dynamic braking is possible. Multi-speed, squirrel-cage motors with two or more frequencies have been tried, but the control and wiring is quite complicated, and although a 4 to 1 speed range is possible, only a limited number of points of control may be obtained.

The direct-current system is acknowledged as most satisfactory, and these are divided into two classes, viz., the single-voltage and the double-voltage systems. With the latter system, using 125-250 volt supply, it is possible to obtain a 4 to 1 speed range on the calender with motors having a 2 to 1 speed range by field control. With a single-voltage system a 4 to 1 range by field control may be obtained, but a more expensive motor is required. There are, however, certain advantages in this system, such as a reduction in the cost of the generating equipment, the switchboard, the wiring and the motor control, which will make it worthy of consideration in many cases. The choice will depend largely upon local conditions and upon the size of motors to be installed. If the motors are to be of 150 h.p. or over, the cost of the single-voltage motor equipment becomes excessive, but if the motors are 100 h.p. and below, the single-voltage system should certainly be considered.

Calender Control.

Similar operations of the calender may be attained with either the single or the double-voltage control, although the latter is supplied with drum-type master switch, and the former with a field rheostat for regulating the speed. Both these equipments may be operated from a 5-button station marked **start, stop, fast, slow** and **inch.** When the **slow** button is down and the **start** button is pressed,

the motor will accelerate to the slow speed, which is used for "threading in." If the **fast** button is then pressed the motor automatically accelerates to the speed corresponding to the setting of the master switch or field rheostat. As long as the maximum speed is satisfactory for the work that is being done the entire operation may be obtained from the push-button station located on the calender frame. Pressing the **stop button** not only disconnects the motor from the line, but also applies dynamic braking, bringing the motor to a quick stop. Safety switches are also installed, which operate in the same manner as the **stop** button, but after having been opened, must be reset by hand before the calender can be started.

Direct-Current Supply for Calender Equipment.

Direct current, either single voltage or double voltage, may be obtained from the alternating-current supply, either by means of rotary converter or a motor generator set. With the rotary converter is required a special set of transformers to supply the correct alternating-current voltage to the rotary, and the combined efficiency of the rotary, together with the transformer, is considerably higher than that of the synchronous motor generator. This higher efficiency often indicates the use of the rotary converter, especially in larger sizes, but the rotary converter has certain limitations which often more than offset the higher efficiency obtained. With the rotary converter best operation is obtained with a field setting to give 100 per cent. power factor, and as the fields are compound wound, and as the rotary is generally operating at loads less than full load, the actual power factor is usually somewhat lagging. Besides this, the direct-current voltage has a direct ratio to the alternating-current voltage.

These objections are overcome with a synchronous motor generator set, as a variation in the voltage has practically no effect on the speed and consequently on the direct current voltage. It is also possible to supply a synchronous motor of any desired capacity to improve the power factor of the total load, and bring it up to any desired value.

THE LATE JACOB KAUFMAN.

One of the pioneers in the rubber and lumber industries of Ontario passed away on April 21st, at Kitchener, Ont., when Mr. Jacob Kaufman, president and founder of the Kaufman Rubber Company, Kitchener, died after about a year's illness. The late Mr. Kaufman was an outstanding figure in the commercial development of Kitchener.

In 1900 Mr. Kaufman became interested in the former Berlin Rubber Footwear Manufacturing Co., and three years later started the Merchants Rubber Co., which in 1906 was sold to the Canadian Consolidated Rubber Co. In 1907 he started the Kaufman Rubber Co., Ltd., which industry has progressed and expanded until to-day it is a credit to the community and represents a large percentage of the rubber footwear business of Canada. He was largely responsible for the establishment of the rubber industry in Kitchener, which has expanded and at present gives employment to about 3,000 people. In 1877 he built a sash and door factory, which he rebuilt and enlarged in 1888, additions having since been made from time to time. He also operated saw mills at Rosseau Falls and Trout Creek, Ont., and also acquired a charcoal and wood alcohol plant at the latter place.

THE CASTOR OIL PLANT.

The Castor Oil Plant (*Ricinus communis*) cannot safely be sown until the danger from frost is over, and, as mature plants will withstand only a few degrees of frost in autumn, the growth of this species is practically confined to the frostless season.

To determine whether the climate at Ottawa was suitable for the cultivation of this plant, trials were made during the years 1916, 1917 and 1918. Seeds of different varieties obtained from Russia, Holland, United States and West Indies were sown. Of those obtained from the West Indies, only one variety ripened seeds, while most of the other varieties from the same source did not even come into flower during the season of growth. A considerable number of well-ripened seeds were obtained in the case of the seeds secured from the first three countries, the Dutch seed giving, on the whole, the best results.

In 1916, the seeds were sown on 26th May. The average height of the Russian variety was 2 feet, and the first seeds were ripe on 25th September. The average height of the Dutch variety was 2 feet 9 inches, and the first seeds were ripe on 23rd August. In the case of the seeds obtained from Washington, D.C., the average height was 2 feet 3 inches, and the first seeds were ripe on 25th September.

In 1917 seeds of the same three varieties were sown, the seed being obtained from the plants grown on the Central Experimental Farm in 1916. The seeds were sow non 30th May, and the crop was harvested on 2nd October. The Russian variety attained an average height of 6 feet, the Dutch variety an average height of 5 feet 9 inches, and the Washington variety an average height of 4 feet 6 inches.

An analysis of the whole seed made by the Dominion Chemist gave the following amounts of oil present: Russian, 38.8 per cent; Dutch, 27.7 per cent; Washington, 39.3 per cent.

In 1918 the seed sown was obtained from the plots grown in the previous year. The seed was sown on May 23, and gave the following results: Russian attained an average height of 5 feet 2 inches, and the first seeds ripened on 16th September; Dutch attained an average height of 4 feet 3 inches, and the first seeds ripened on 14th September; the seed obtained originally from Washington gave an average height of 5 feet 2 inches, and the first seeds were ripe on 16th September.

In most of the ordinary varieties of Castor Oil the capsule containing the seed bursts when ripe and scatters the seed for some distance around the parent plant. However, there are some varieties in which the capsule remains closed. There is reason to believ that som of these varieties might be grown successfully in the dry belt of British Columbia.—J. Adams, Assistant, Dominion Botanist.

CHANGES IN ONTARIO MINING ACT.

By amendments to the Mining Act, introduced by Hon. Harry Mills, Minister of Mines, there is a reduction from $10 to $5 in the fee charged for recording a claim by a license holder for himself. The fee for recording a claim staked out by someone else has been increased from $10 to $15. Another amendment is that no licensee can stake out more than three mining claims for himself, or more than six mining claims for others, in any one mining division a year. Every licensee who stakes out a claim can get an assay twice within the twelve months after staking his claim by sending a sample to the provincial assayer at Toronto with one departmental coupon in the case of gold, silver, lead, copper or metallic iron, and by sending two coupons he can get one assay made without cost for tin or tungsten.—*The Northern Miner.*

CANADIAN OIL EXPLOITATION AND PROSPECTS.

The world's supplies of petroleum are to-day everywhere attracting the attention and serious consideration of Governments and industry. The continued source of supply and control of that supply, the vastly increasing demand for liquid fuel as the motive power for transportation of all kinds by land or water, from the humble car now owned by the average citizen to the latest type of battleship of the British Navy bunkering over 1,300,000 gallons, for power and lubrication in the world's factories, for lighting purposes and for surfacing the enormous road mileage which must be maintained to meet conditions of modern mechanical transport, are questions of vital interest throughout the world, and here in Canada point the way to a field of opportunity and effort whose importance to the country as a whole can hardly be exaggerated.

With two of the large oil producing fields, Mexico and Russia (sources of 20 per cent of the world's supply), temporarily handicapped by unsettled conditions, with the probable early decline of the United States fields (the source of 60 per cent of the world's supply), reports which come to hand of prospecting and drilling activities of the approaching season in the vast potential oil fields of Western Canada are of greater national importance than almost any other proposed line of development.

Canada's Annual Production.

According to Government statistics, Canada's annual oil production up to date stops short of 310,000 barrels (90 per cent from the Ontario fields) in comparison with over 330,000,000 barrels produced by the United States. A leading United States Geologist (J. D. Northrop), writing in a recent issue of the *Engineering and Mining Journal*, states, "petroleum production in the United States is expected to reach its maximum this year and to decline steadily hereafter," and in another issue of that journal the same authority states, "Canada is the only country in which the petroleum industry may be said to be controlled by foreign (United States) interests."

Beyond calling attention to this latter statement, this article is not concerned with the question of political control, but is an attempt very generally to summarize those conditions which tend to a conservative optimism as to the vast oil possibilities to-day hidden in the unexploited sedimentary strata of Canada.

Area of Possible Oil Fields.

If we take the map of Canada and very roughly draw a line from east of Great Slave Lake passing through Lake Athabasca down to the north end of Lake Winnipeg, along the east shore of that Lake to its southerly end, thence to and along the North shore of Lake Superior to the Soo, and thence along the northerly shore of the Georgian Bay to Parry Sound, thence due east to the St. Lawrence River, and along the northerly bank of that river to its mouth, we shall have divided the Dominion into two vast areas, that lying to the northward of our line being regarded as generally hopeless for oil prospecting, that lying westward and southward being from its geological formation rich in promise for the finding of productive oil fields within the economical range of practical drilling.

If we further examine the Geological map of this latter area, we find that the great oil-bearing strata of the North American Continent, which in the United States have been productive of the richest and most prolific oil reservoirs of the world, contributing in fact over 60% of the world's total oil supply, constitute the principal geological formations and outcrops of this vast Canadian territory.

All of these Geological formations contribute in the various oil fields of the United States to the vast total production of that country.

It requires, therefore, no more than an average share of optimism to predict that Canada's future as a world oil producer is certain, and only awaits the assured result of time and capital expended on the scientific location of favorable structures of these formations and their subsequent exploration by the drill.

The Western Provinces.

In the Western Provinces attention in the past has chiefly been divided between the possibility of commercial development of the bituminous sands exposed on the Athabasca River, commonly called the "Tar Sands," and the search for petroleum in the vast regions of the Mackenzie River Basin, north and south of Edmonton, in Northern, Central and Southern Alberta, in the Peace River and Great Slave Districts, whilst recently reports are to hand of organization for prospecting and drilling in the districts of Kooteney and Vancouver, B.C.

The Athabasca Tar Sands.

The outcrop area of the "Tar Sands" of the Athabasca River has been estimated to extend from 750 to 1,000 square miles, and the deposits probably extend considerably further to the southward under heavy cover. Various estimates have been made of the probable oil content of these sands which have been reported to range in thickness from 140 to 225 feet, and to contain 25 per cent of oil, but in fact the numerous shallow wells drilled have only obtained small amounts of black viscous oil showing on analysis a high percentage of light oils. The more volatile and valuable constituents of this petroleum have long since disappeared and, as the flow has ceased, the rocks from which it issued are probably exhausted, in short these tar deposits are all that remain of a vast oil reservoir now spoiled and wasted. Further, the horizontal stratification of these deposits is entirely against the probability that they will in themselves be found to contain reservoirs holding large pools of pay-oil, since the entire absence of folding in the strata is unfavorable to the large accumulation of such reservoirs, and moreover, denudation by ancient glacial action has exposed the oil sands to the atmosphere, so that in the course of ages, evaporation of the lighter oils has taken place, leaving only the heavy tarry residue, now in evidence, dispersed throughout these vast deposits.

Commercial Value of Tar Sands.

Hence it is likely that for years to come, the commercial value of these tar sands will be limited to their development as bituminous road making material for which purpose their suitability has already been demonstrated in the city streets of Edmonton, and the economics of the question are being fully investigated by the Department of Mines of the Dominion Government. Improved methods of distillation may make the recovery of the oil content of these deposits a commercial proposition as also may the future exhaustion of producing oil wells, but this latter is too far ahead to be of interest to the present generation.

In the Athabasca District, at Pelican Rapids, the Canadian Geological Survey sank a shallow well in 1897 and tapped a heavy flow of gas, and later, at the same place, the Pelican Oil and Gas Company met a heavy gas flow in a shallow drill hole. In 1917-18, the Imperial Oil Company sank two wells along the Alberta and Great Waterworks Railways, and the Tapley Syndicate put down a

third in the same territory. These tests were made by practical men, but success was not attained, a small show of tarry oil being obtained at depths of about 1,000 feet. These results do not, however, in any way disprove the presence of pay oil in the vast fields to the south of this area, which are so far from the outcrops that even the most expert explorer has little data to guide him, and drilling "in the dark" is the only test that can be resorted to.

Scientific Study of Structures.

The first essential, therefore, for the successful discovery of liquid oil accumulations is the location of suitable structures of the oil bearing sands, and their exploration by drills, those beds distant from the area of outcrop of the Athabasca sands offering better prospects than those in the immediate vicinity, as also do the regions Northwest of Edmonton and Athabasca Landing, where favorable structures which are independent of these tar sand leakages are known to exist.

Whilst numerous widely separated wells have been sunk, there has, in the past, been a tendency to locate them without particular regard to testing the main structural features of the promising horizons, but recently considerable work has been done in the direction of scientific geological study of these structures. The Geological Survey of the Department of Mines, as well as such large commercial organizations as the Imperial Oil Company, The Standard, The Shell, and the Anglo-Canadian Oil Companies, are accomplishing good pioneer work in locating the regions which show the folded geological structures of the petroliferous sands most favorable to success in oil drilling, and particular attention has been paid to the Peace River district of Northern B.C. and to the Great Slave Lake district.

The Peace River District.

The upper cretaceous formations of the Peace River District are reported as consisting of a gentle homocline not favorable to formation of oil reservoirs, but further West the survey parties report more promising conditions of sharp folding and domes.

The above does not in any way disprove the existence of Peace River oil reservoirs in the underlying Devonian sands, these being non-conformable to the upper cretaceous deposits which alone have been explored by the drill to date. Indeed, the very fact that these Devonian beds are deformational to the upper beds may be an encouragement to further prospecting of this district, since, if the deformational bed has a gradient it may go far to neutralize possibly unfavorable conditions created by the homoclinic structure of the overlying beds. Moreover, this homoclinic structure is not necessarily unpromising for oil reservoirs provided that the gradient is sufficient to allow of gravitational segregation of the water, oil and gas; elsewhere conditions of sand porosity and cementation have resulted in the isolation and accumulation of large oil reservoirs in such homoclinic structures, and indeed some portion of every anticline, the formation usually reported on as most favorable for oil is in itself a homocline.

The Peace River Oil Company, the Tar Island Oil and Gas Company, the Consolidated Oil Fields, Ltd., the Victory Oil Co., and the Northern Pacific Oil Company have all had drills in this region penetrating to depths of from about 1,000 feet to 1,300 feet. Their general experience has been the finding of small quantities of heavy tarry oil, and, in an effort to reach the lower Devonian formations, encountering heavy flow of gas or water which must be shut off before further exploration can proceed. This difficulty is, however, purely physical, and the Three Creeks Oil Company are reported to be now installing large pumping units to deal with this obstacle.

Southern Alberta.

In the district around Calgary considerable drilling has been done, and in some cases small flows of from 15 to 30 barrels a day, ranging from very light to heavy oil, have been obtained. Geological opinion is that in this territory the rapid descent of the oil-bearing strata from the faulted and folded areas created by the mountain uplift has placed these strata at so great a depth in this district as to make drilling a doubtful commercial undertaking. Some experts also hold the opinion that the very light finds of oil in the Calgary field are indications that the original source of the oil, the parent reservoir, was at a great distance, and that the oil in its lateral movement has been subjected to so great filtration as to have rendered it an unpromising prospect. New methods of distillation of these light oils may, however, give them an added value and revolutionize opinion in this respect, converting this class of oil into a valuable source of supply of motor fuel spirit.

The principal companies which have undertaken drilling in this field in the past are the Southern Alberta Oil Company, The Prudential Oil Company, and the Calgary Petroleum Products Company, most of the wells being in the Sheep River area.

South and Southeast of Edmonton

Examination of the vast districts southeast of Edmonton lying between the North Saskatchewan and the Belly Rivers have determined that the reported anticlinal folds of the upper cretaceous structure do not exist in Central Alberta. The homoclinic structure of this area may be responsible for the difficulty hitherto experienced in locating any large accumulation of petroleum oil, but the area is vast and the absence of anticlines does not disprove the existence of such reservoirs.

It is said that the Imperial Oil Company, The Shell Oil Company, and some other interests will spend large sums in drilling in this field during 1920, and the activities of such experienced oil men show how great is their confidence in the promise of this region.

Kootenay and Vancouver Districts.

The Amalgamated Oil Co., Ltd., and the Crow's Nest Oil Company are reported to have acquired extensive rights in the Kootenay District, and to be either actively engaged in drilling or preparing to do so in 1920, and on the International Boundary, near Vancouver, a Company known as the Boundary Bay Oil Company is reported to have drilled to a depth of over 700 feet, and to have produced a small flow of oil, whilst in the same district the Pitt Meadow Oil Wells Company and the Empire Oil and Natural Gas Company have sunk wells, and the Spartan Oil Company has drilled a test hole near Burnaby Lake to a depth of about 2,000 feet, at a point where one of the most important oil seepages occurs.

It is difficult to analyze the geological promise of the Kootenay District in regard to large oil reservoirs, owing to the faulted and fracture-displayed nature of its structures. The reports of the Dominion Government Geological Survey show large outcrops of Carbonaceous limestones (elsewhere a prolific source of oil) and of post-Cambrian rocks, and petroleum has actually been found in these regions, and verified by Dr. Selwyn as far back as 1891. Geologists have reported that in this region, the ancient limestones have been thrust forward over cre-

taceous beds in which the petroleum may have originated, and which may yet be the source of unknown quantities of oil. In this connection the following quotation from the Dominion Government Geological Survey Annual Report of 1898 is illuminating having regard to present day activities above noted.

"The indications certainly seem to be sufficiently promising to warrant some outlay in the work of sinking test wells, notwithstanding the generally disturbed and broken character of the formations of the region," and it may here be noted that the most productive of the United States oil fields, that of California, is of diversified geological structure complicated by faults, outcrops, and igneous intrusions.

In the Vancouver district, oil and gas seepages have been known for some years past, though their origin has not been demonstrated, but it has been thought that they may indicate oil pools in the sedimentary rocks underlying the Fraser River. Few natural outcrops of these rocks exist, but it is thought that they are folded in a series of anticlinal and synclinal folds favorable to accumulation of oil pools, and it is reasonable to suppose that they are an extension of the structures of the same deposits known to exist further south of the International Boundary, and a striking general resemblance may be noted between the geological structures of this district and those of the great producing oil fields of California, which have been estimated to contain seventeen billion barrels of fuel and asphaltic oils.

The Fields of Eastern Canada.

This review would be incomplete without reference to the oil fields of Eastern Canada, in fact the Devonian formations of Ontario are at present producing the greater part of the output of the Dominion and have been productive since 1857. In this province the Mosa oil field in Middlesex County is the largest producer and contributed 108,988 barrels in 1918 to the provincial total of 288,760. This production is reported by Government Geologists to be from the crest of a dome of the Delaware limestone (corniferous) at depths of about 300 feet. This productive field was developed from an abandoned prospect as a result of careful study of structural formations followed by practical drilling, it is quoted as proof that the possibilities of the Ontario oil fields are far from exhausted.

There are eleven other oil fields in the province, all producing from shallow wells in the Devonian formations. In the opinion of some experts, deeper lying formations in Ontario, which have not yet been explored by the drill, may prove to be extensions of the Lower Devonian and Silurian formations which constitute the great oil fields of Pennsylvania and Central Ohio.

The Maritime Provinces.

In New Brunswick and Nova Scotia oil possibilities have attracted attention since 1859, but competition with the enormous output of the adjacent United States oil fields has done much to discourage production. The New Brunswick Petroleum Co., in about 1900, drilled over 70 wells in the Southeastern district of the Province and obtained a small flow of pay-oil from the Carboniferous and Devonian formations. More important are the oil shale deposits in Alberta County, locally known as Albertite, which comprise the residuum of a petroleum field exhausted through seepage.

These petroliferous shales contain black, shiny bitumen, which may yet have high commercial value when modern methods of distillation shall render the recovery of their by-products commercially possible—such a development may be indicated in the near future in the recovery of motor fuel spirit through new processes. In 1908 these oil shales were tested for yield of crude oil and Sulphate of Ammonia in the retorts of the Pumpherston Oil Co., Scotland—the average yield being 40.09 gallons of crude oil and 76.94 lbs. of Sulphate of Ammonia per ton of shale—the result comparing favorably with Scotch shales, which have been successfully worked for many years. In Nova Scotia efforts to find oil were made as early as 1864, but without commercial results. Various seepages occur and favorable geological Devonian and Corniferous formations are noted in certain districts, but the structures are not considered promising, having been badly broken up and contorted. Oil shales have been known in this province for over 60 years; their analysis yields somewhat similar results to those of New Brunswick, but lower in Ammonium Sulphate, they are at least as good as the sucessfully operated Scotch deposits. The remarks as to their probable development which have been made above in connection with the Albertite deposits of New Brunswick, apply equally here.—Prepared by Industrial Resources Department, Canadian Pacific Railway.

AMERICAN CHEMICAL ENGINEERS TO MEET IN CANADA

The summer meeting of the American Institute of Chemical Engineers for 1920 will take place this year in Canada. The date has been fixed, tentatively, as June 21-28. Plans as worked out at present include a meeting of two days, Monday and Tuesday, 21st and 22nd, at Montreal, for the business sessions, reading of papers and possibly one or two excursions to chemical industries in Montreal. Wednesday, 23rd, will be spent at Ottawa, inspecting the Government buildings and laboratories of the Bureau of Mines and visiting the copper and nickel refinery of the British-American Nickel Corporation at Deschene, Que. Thursday, the 24th, visits will be made to the plants of the Deloro Refining and Reduction Company at Deloro, and of the Industrial Alcohol Company at Corbyville. Friday, the 25th, will be spent at Shawinigan Falls, Que., where our American visitors will have an opportunity of seeing the electro-chemical plants and power development there. On Saturday, the 26th, a trip to La Tuque, Que., will be made, where the large sulphate pulp mill of the Brown Company will be visited. From this point a trip is being planned to the very large artificial lake at La Loutre. This includes a 50-mile boat trip, stopping at a fishing camp on the lake, where there will be an opportunity for boating and fishing. After a stop of a day or two at this point the return trip will be made to Quebec. Arrangements have been made with the Canadian National Railway for a special train.

Undoubtedly the week as planned will prove as profitable as it will be delightful. Not only will the American chemists be benefited by their first-hand knowledge of Canadian industries, but the week should also prove a splendid advertisement for this country, its natural resources and industries.

WILL GET FACTS REGARDING OIL RESOURCES.

The Imperial Oil Company is conducting a thorough investigation into the commercial value of the oil resources of Alberta and this year eight drilling rigs of the company will make drills at different points in the Province. The drillers will go down sufficient depth to prove conclusively whether or not oil exists there in commercial quantities.

CHROMATE DETERMINATION OF LEAD.

By C. W. Simmons, J. R. Gordon, and H. C. Boehmer.

The method of titration for lead, which has been precipitated as chromate as given by Waddell* is an especially delicate one giving concordant results within five hundredths of one per cent. The necessary details, though essential, are very easily attained. The procedure is as follows: After the ore has been dissolved in HCl followed by HNO_3 and the volume of the solution reduced to 8 cc. add ammonia until a permanent precipitate of hydroxide is obtained. Dissolve the precipitate in acetic acid adding an excess. If the solution is not clear, add solid ammonium acetate and warm. Do not boil if there is any danger of iron being precipitated as basic acetate. Keep volume below 50 cc. and use only about 3 gms. of ammonium acetate at the outside if it is desired to have complete precipitation of chromate within 5 minutes. Add 10 cc. of 10% potassium chromate. The lead is precipitated as an *orange colored crystalline precipitate* of lead chromate. Keep liquid warm for 5 minutes before filtering. Dissolve the precipitate in a mixture of 25 cc. concentrated hydrochloric acid and 75 cc. of water, dilute to nearly 200 cc. add a little less than a gram of potassium iodide and titrate the iodine thus set free, with sodium thiosulphate run in slowly, say about three drops a second, adding starch solution towards the end and shaking the liquid vigorously after addition of every few drops. The whole procedure is most easily carried out in Erlenmeyer flasks. This procedure if followed exactly has in our experience always given the desired result. However, Dr. Waddell found that his students sometimes obtained a fine yellow colloidal precipitate of lead chromate which only filters with difficulty.

The object of this work was to investigate and determine if posible how this objectionable precipitate may be avoided.

We used a stock solution of lead nitrate containing 4 grams per litre.

Our results are as follows:—

A.—Effect of Rate of Precipitation.

We found that the rate of precipitation did not affect the nature of the precipitate. An orange colored precipitate is formed whether the precipitant is added rapidly or slowly.

B.—Effect of Varying Amounts of Ammonium Acetate in the Solution.

1. Using the quantity of potassium chromate specified above and varying the amount of ammonium acetate from 2 to 7 grams did not affect the color of the precipitate.

2. If, however, an excess of ammonium acetate say 7 grams were added and the amount of chromate decreased a yellow colloidal precipitate would be obtained.

3. If too much ammonia is added in the neutralization of the original acid it is quite apparent that this would give the same effect as adding excess of ammonium acetate.

C.—Effect of Acetic Acid.

A yellow precipitate was obtained when acetic acid exactly sufficient to neutralize the ammonia was added. This effect was not obtained if excess acetic acid was added.

D.—Effect of Dilution.

1. If the solution is greatly diluted there is a tendency for the yellow form to be thrown down. The shade is, however, doubtful, as the orange precipitate would appear lighter in color in a dilute chromate solution. We experienced some difficulty in filtering this product.

2. Using a fairly saturated solution of lead nitrate (50 grms. per 100 cc.) we found that if sufficient of the precipitant was added and the ordinary procedure followed the lead would all be precipitated in the orange form.

E.—Effect of Temperature.

If the precipitation is carried on in the cold the orange precipitate can only be obtained from fairly concentrated lead solutions. Thus a yellow precipitate will be obtained from a cold dilute solution. If, however, this is heated in a steam bath for ½ hour it will probably be converted into the orange form.

F.—Effect of Presence of Chlorides and Sulphates.

Five gram amounts of either chlorides or sulphates have no effect on the precipitation of lead chromate.

Summary.

1. Rate of precipitation and presence of soluble salts has no effect on the precipitation obtained.
2. If sufficient chromate is added excess ammonium acetate has no undesirable effect.
3. Importance of excess chromate should be emphasized.
4. Excess acetic acid is essential.
5. Solution should be kept concentrated and warm.

If in following out the method a yellow precipitate is obtained it may be remedied by studying the above summary determining the particular deviation from the procedure, adding the deficient reagent, and warming for ½ hour on steam bath. It is not allowable to do anything that would cause the precipitation of ferric acetate.

Experiment showed that there is no difference in the chemical composition of these two precipitates. The difference is purely a physical one and the difficulty with the method is not that all the lead is not precipitated, but that the yellow form is hard to filter. The reaction between chromic acid, hydrochloric acid and potassium iodide is a time reaction hence the large quantity of acid used in the process. The acid must be dilute, however, and cold, otherwise the chromate will be decomposed somewhat before addition of the potassium iodide.

Queen's University, Kingston, Ont., April 16th, 1920.

*Waddell. *Quantitative Analysis in Practice.* J. and A. Churchill, London; P. Blakiston, Philadelphia.

SHIPPING AVAILABLE FOR NITRATE.

Indications are that enough Chilean nitrate will reach the United States to meet the nitrate requirements of American farmers for this season. The limiting factor was lack of tonnage to bring the nitrate to American ports. A conference was held on February 11 between the Shipping Board and representatives of principal nitrate concerns, and an agreement was reached under which the Board agrees to furnish prompt requisite tonnage covering a period up to July 1. After that date, according to the agreement, importers will submit their sales on the first of each succeeding month and the Shipping Board will enter into further engagements to supply the required tonnage.

Deliveries were somewhat delayed for February and March, but nitrate concerns believe that they will now be able to handle April, May and June arrivals in such a way as to clear up all deliveries that are behind and to take care of the forward business in good form. Indications are that importers will make deliveries in accordance with contract, subject to some possible delay during the next few weeks.

FRENCH PROPOSE POTASH PURCHASE.

Recent despatches from France state that the French Government proposes the purchase of the immense potasb deposits in Alsace-Lorraine, for some billions of dollars.

BOOK REVIEWS

"FUEL PRODUCTION AND UTILIZATION."

By Hugh S. Taylor. Bailliere, Tindall & Cox, London. Westman Press, Ltd., Agents, Toronto, Pages XIV & 297. Price $3.00.

The book is frankly a supplement to academic instruction. The fuel resources of the various countries must have a most important bearing on industry, and the author has naturally drawn upon the exceedingly large amount of work that has been done in the United States, both by individual companies and the Government, on problems which had efficient utilization of and research on fuels as their aim.

In the introductory section, considerable attention is given to what is styled the "Physical Chemistry of Fuel." The relations of chemical processes and thermal changes, heats of reaction and temperatures, gaseous equilibria, are demonstrated, following standard mathematical procedure introducing the usual symbols of physical chemistry. For anyone who has had a grounding in physical chemistry and mathematics, these should certainly prove instructive as types of expressions which might be applied in specific cases with some value.

Discussing direct combustion of coal, the general principles of stoking and boiler practice are stated in a short, direct manner, while more detailed attention is given to coal briquetting and the use of powdered fuel. For the space taken, a good conception of present practice in use of powdered fuel is outlined. High and low temperature carbonization receives treatment at some length.

As problems along these lines have been continually receiving study, the practical information discussed in the text and the references should prove valuable. The utilization of coke in the production of iron, and in a variety of metallurgical processes, when taken along with both a theoretical and practical review of water gas production, makes an interesting section.

The whole of the remaining field is covered by sections on fuels from carbonization, lignites, peat and its utilization, wood distillation. Under Synthetic Fuels, possibilities of acetylene and synthetic alcohol are dealt with. In general, the work that has been carried out in Canada has been touched upon, and since so many Canadian problems are related to the fuel question, the author has rendered a service both to those who are specially interested in a particular branch and that large class of technical men who may wish to broaden their general conceptions regarding recent practice.

LABORATORY MANUAL OF ORGANIC CHEMISTRY.

By Harry L. Fisher. 323 pp. John Wiley & Sons. Inc., New York. Price, $2.25.

This book is apparently the crystallization of a course designed for large clasess in one particular University, and as such, loses to a great extent its general value as a text book. A course in organic preparations presupposes an instructor, more or less competent to teach manipulation by personal demonstration, and a course of lectures in which the theory is discussed. The book could have been made of greater use if the space taken up by questions and elaborate instructions concerning the setting up of apparatus had been devoted to additional preparations, thus providing its users with a larger choice of experiments.

The real value of the work, which is considerable, lies in the second section. This contains much recent information, usually obtainable only at the expense of searching the literature, and will make the volume a welcome addition to any library.

W. STANLEY FUNNELL.

"THE ORGANIZATION OF INDUSTRIAL SCIENTIFIC RESEARCH."

By C. E. Kenneth Mees. McGraw-Hill Book Co., Inc., New York. pp. 175. Price, $2.00.

If there has been one thing more than another that has held the attention of leading men of science during the past few years, it has been the general subject of research. Most of these discussions have taken up, from various angles, the advantages and the national importance of scientific and industrial research.

Dr. Mees has had experience all around the problem. His book is a contribution to the definite, rather than the general literature available, and as such is exceedingly valuable. The relation of the University to industrial research, the types of work to which universities are adapted, the relation of research in special fields to the location of industries, the various types of existing research laboratories (both Government and otherwise), are some of the subjects treated in the initial portion of the book. The position of the co-operative laboratory, and some outline of the work of these laboratories in various countries is reviewed.

The greatest practical value of the work to most executives will be found in the discussion of the position of the research laboratory in the industrial organization, matters relating to internal organization, staff, buildings, equipment, and the direction of the work. Cost and organization plans are given, and references made to specific industries.

The work is to be recommended as a very readable and stimulating contribution from an authoritative source.

L. E. W.

BULLETINS RECEIVED.

A Glossary of the Mining & Mineral Industry, by Albert H. Foy, Department of Interior, Washington, D. C. Cloth 75c., from Superintendent of Documents.

A distinct contribution to mining literature and an evidence of the good work that a Government Department may do; 20,000 technical and local terms, relating to metal mining, coal mining, quarrying, petroleum and natural gas are listed. The names of minerals, rocks and geological terms are given. There must be at least several thousand words listed that have gradually grown to be the every day language of classes of workmen, but which have never been incorporated as standard words of the English language.

Space has been found for terms relating to ceramics, the clay industry, glass making, foundry practice, railway construction, electrical installation and power plant equipment, and some chemical terms relating to metallurgical practice.

No better test could be devised, if the actual practical knowledge and experience of any candidate for a position were in question, than to ask that a few of the terms listed be defined. Test yourself on the following:— "buddy," "bug dust," "Canadian pole system," "carrillo," "cube coal," "dead oil," "deal," "false stull," "mud cap," "rabot," "rattler," "spike team," etc.

CONVENTION OF CANADIAN CHEMISTS

Toronto, May 27th and 28th, 1920.
Third Annual Meeting.

PRELIMINARY PROGRAMME OF PROCEEDINGS.

Thursday, May 27th.

9 A.M.—Registration.

10 A.M.—Opening Meeting, Chairman Dr. W. L. Goodwin. (Chemistry and Mining Building, University of Toronto.)

Papers:

Inner Life and Habits of Metals, by H. J. Roast and C. F. Pascoe.

History of Varnish Industry, by C. Holland.

Canadian Opportunities in Industrial Chemistry, by S. J. Cook.

Some notes on Decolorizing Blacks, by C. F. Bardorf.

(A number of other papers are being arranged for.)

Visitors are specially invited to inspect Industrial Exhibits in the Main Hall, Mining Bldg.

1.00 P.M.—Luncheon, Hart House, University of Toronto.

2.30 P.M.—Address (Hart House).

Chemistry under a Constitutional Government, by Dr. Chas. H. Herty, Editor, Journal of Industrial & Engineering Chemistry, New York, N. Y., and Past President of the American Chemical Society.

8.15 P.M.—Theatre Party and Novelty Entertainment, Hart House.

Friday, May 28th.

Canadian Institute of Chemistry.

9.30 A.M.—Business Meeting. Chairman, Prof. J. W. Bain.

1.00 P.M.—Luncheon, Hart House.

2.30 P.M.—Visits to Industrial Plants in the City.

7.00 P.M.—Annual Dinner, Dr. W. L. Goodwin, Chairman.

Joint Dinner of Society of Chemical Industry and Canadian Institute of Chemistry. Special Programme and Entertainment. Alfred Burton, Hon. Secy. Canadian Section, Society of Chemical Industry, convener.

Committees:

Convention Chairman, Prof. Lash Miller.

Finance, Messrs. M. L. Davies and L. T. Acton.

Excursion, Mr. W. H. Thom.

Publicity and Printing, Mr. L. E. Westman.

Programme, Messrs. H. M. Lancaster and T. L. Crossley.

Reception, Messrs. A. Burton and J. R. Donald.

Dinner, Dr. H. Van der Linde.

Convention Secretary, Mr. C. F. Thurlow.

NOTICE TO VISITORS.

The question of hotel accommodation has been solved by the University. One of the large residences at the University will be at the disposal of visiting chemists. First class accommodation and meals are available at nominal rates to all. The building is central in the university group, and a real "get together" spirit may be maintained during the whole time. Those who wish to use residences should reserve rooms with Mr. L. T. Acton, 521 Front St. East, c/o William Davies Co., Ltd.

A growing feature of the Annual Convention will be the number of industrial and chemical exhibits marking the progress of chemical industries in Canada. These will be worth while.

Up to the time of going to press the following firms had reserved space for exhibits in the Mining Building at the University:—

Arkell Safety Bag Co.; Bristol Instrument Co.; Canadian Laboratory Supplies, Ltd.; Canadian Chemical Journal; Central Scientific Co.; J. P. Devine Co.; J. F Hartz Co., Ltd.; Nichols Chemical Co., Ltd.; The Norton Co.; Ontario Oil and Turpentine Co., Ltd.; T. E. O'Reilly Co., Ltd.; Salts and Potash Co. of Canada, Ltd.; Technical Products Co.; McKay School Equipment Co.; Lymans, Limited.

MONTREAL MEMBERS OF SOCIETY OF CHEMICAL INDUSTRY VISIT SHAWINIGAN FALLS AND GRAND MERE.

Some fifty members of the Montreal and Ottawa branches of the Canadian Section of the Society of Chemical Industry spent a very instructive day on May 8th visiting industrial plants and power stations on the St. Maurice river. Every convenience of travel was made possible by taking special cars from Montreal by way of Three Rivers.

The first stop was made at Grand Mere, where a very beautiful town of seven thousand has grown up around the power plants and the Pulp Mill of the Laurentide Co. The whole gigantic plan for the development of power from the St. Maurice River may be well appreciated from this point. The flow of the river is controlled by two dams, the larger of which forms a lake ninety miles square near head water. The whole system of dams and power plants is so arranged and under such co-operation that eventually very little of the available power will remain unutilized.

The relation of the hundreds of thousands of horse power developed here to the industries of Montreal and Quebec generally begins to be appreciated as the operations of the large turbines and generators are explained. At the Laurentide Paper Mill a busy hour was spent following the process from the barker to the finished roll and the output of two hundred tons per day of news print in a fair indication of activities.

Below Grand mere some five miles the City of Shawinigan Falls was reached by the party in time for lunch at the now rather famous Cascade Inn. Here the following plants were visited:

Power House, Shawinigan Water & Power Co., Ltd.; Belgo Canadian Pulp and Paper Co., Ltd.; Canada Carbide Co., Ltd.; Canadian Electro Products Co., Ltd.

At six o'clock a meeting was held at the Technical School where with Mr. C. Hazen as Chairman, three papers were given as follows:

(1) Synthesis of Organic Compounds from Acetylene. By H. W. Matheson.

(2) The Relation of the Chemist to Mechanical Engineering. By F. Stadler, General Manager Belgo Pulp & Paper Co. (read by Mr. G. Meerbergen).

(3) Address by R. A. Witherspoon on "The

Evolution of the Electric Furnace for the Manufacture of Carbide."

A banquet at Cascade Inn completed the pleasure of the day. The thanks of the guests were presented to those who had made possible the arrangements and who assisted in entertaining the visitors at the various plants by Mr. T. H. Wardleworth and Mr. C. Holland on behalf of all, and Mr. S. J. Cook for those from Ottawa in particular. Mr. Hazen and Mr. Witherspoon spoke on the general idea of establishing a branch of the Society at Shawinigan, and a Committee was appointed to take up the question.

TORONTO BRANCH— SOCIETY OF CHEMICAL INDUSTRY.

The session 1919-20 has been a most successful one for the Toronto Branch Society of Chemical Industry. The meetings held have all been exceptionally well attended, and the great interest taken in the activities of the Branch by the members has been manifest throughout the session, and was strongly in evidence at the final meeting on Thursday evening, April 22nd, when there was a good turnout to hear the speaker of the evening, Mr. C. Price-Greene, Commissioner Industrial and Resources Department, Canadian National Railways, an active and regular attendant at the Toronto Branch meetings. The subject of Mr. Price-Greene's address was "The Natural Resources of Canada and the Chemist," and it is safe to say that everyone present went away with a clearer and more comprehensive view of the potential possibilities of the resources of the Dominion than they ever possessed before. As the Chairman, Professor E. G. R. Ardagh stated at the conclusion of the address, it had been a great privilege to hear such a well defined review of Canada's resources backed up by figures and facts so often lacking in addresses commonly given on the subject.

In commencing his address Mr. Price-Greene declared that he firmly believed that chemistry was the keystone of the industrial structure. Chemistry, he affirmed, was the basis of all the wonderful world developments that had taken place in the past 50 years, developments more wonderful than all that had occurred in the previous 1500 years. He alluded to Col. Grant Morden's recently announced scheme of combining the Canadian iron and steel industries into one great efficient organization backed up by British capital, as a plan of industrial expansion that would bring most beneficial results to Canada. In Ontario alone there were, it was estimated, 425 million tons of iron awaiting development. As regards cost it was deplorable that less than 5 per cent of the coal used in Canada came from Canadian sources. Developments in British Columbia were sure to come, and as a reminder of what could be done in that Province, one had but to think of its great supply of mineral wealth, and the fact that it had today a population not as large as the City of Toronto.

One often heard the remark, commented the speaker, that development in Canada had been slow, but such remarks failed to take cognizance of our small population, and the numerous difficulties that had to be overcome. "No other eight or nine millions of people in the history of the world have accomplished more in the same space of time than the Canadians" declared the speaker.

Continuing the speaker gave a short review of the natural resources of the Dominion as found travelling from East to West. The coal of the Maritime Provinces was referred to, and also the oil shales of New Brunswick. These New Brunswick oil shales would yet be the solution of the fuel problem in that Province. Just prior to the war an American company had been all prepared to develop these shales but when they found that they would have to pay over a million dollars in duty alone on the necessary machinery, they abandoned the project. In Quebec 85 per cent. of the world supply of asbestos was located. Along the north shore of the St. Lawrence there were very valuable lead-zinc deposits practically untouched, while on the same shore just across from Anticosti, was a marvellous iron ore deposit surveyed to cover over 80 miles in length, the largest known deposit of iron ore in the world. It was remarkable that in close proximity to this huge deposit it was possible by the deviation of a river near Severn Plant to develop 4,250,000 h.p. This was an engineering feat already reported upon and able of accomplishment. Coming into Ontario, the speaker reviewed the Northern Ontario mining districts. Out of the Cobalt camps alone $250,000,000 of silver had already been taken. At Porcupine, a comparatively new camp, $50,000,000 of gold had already been extracted. Hollinger was undoubtedly the greatest gold mine in the world, nothing in South Africa comparing to it, and he believed that at the Burke mine a second Hollinger had been found. Larder Lake, Gowganda, Shining Tree, and West Shining Tree were all splendid mining districts.

At Sudbury, 70 per cent. of the world supply of nickel was produced. Going still further west the Mardy Mine in Northern Manitoba and the Flin Fon Mine constituted a vast supply of copper. The oil developments in the Mackenzie River basin were just commencing and the outcome looked promising. At any rate it was worth noting that one large Canadian oil company was spending $500,000 in just "looking around" the area to find out just what could be done. Turning again to Ontario the speaker referred to the importance of the mineral deposits in Central Ontario, particularly in Hastings County. The marble deposits of Hastings County were considered the best in the world, and from a geological survey made they had a depth of 50,000 feet—a truly remarkable deposit—and the deposit was of the highest known grade of marble, one property of it being that ink could not stain it, but washed readily off, whereas in other grades found elsewhere, ink would stain the marble. This immense marble deposit was practically untouched. There were great possibilities in the graphite and talc deposits of Central Ontario. Three cars of graphite had recently been shipped out as good as any the American buyers had received. One often wondered why there had been so many mining failures in Ontario, said the speaker, but very often the operator would have made a better butcher than a mine operator; he invested $200,000 where he should have organized a company and spent $2,000.000. Many of these failures had been in the Rainy River District, and the speaker believed that were these mines opened again fully 50 per cent. of them would be a success.

Turning his attention to the Forest Resources, Mr. Price-Greene considered that the consensus of the best opinion among those who had studied the problem, was that Canada was firmly safe for a long time to come, so as far as pulp wood was concerned, provided a proper method of reforestration was promptly carried out. But in the United States the situation as regards pulp wood was entirely different—they were fast nearing the end of their supply. Inside of from six to eight years, the speaker

predicted, one would see a wave of hysteria about the lack of pulp going all over the United States for that nation would suddenly discover that the end of thier pulp wood resources had come. The consumption of pulp in the United States was something appalling, but not to be wondered at when it was considered that the United States alone consumed just half of the world's supply of white paper, and consumption for 1919 increased by 90 per cent. over that of 1918. The United States consumed 5,500,000 cords of pulp wood per year. One Saturday edition of a Chicago paper uses up the pulp equivalent of 40 acres of spruce trees "at one crack." Taking the whole lumber situation in the United States, that country consumes for all purposes 244,000,000 cords of wood per year. These were facts that caused thinking people in the United States to worry considerably over the future supply. One American lumber man had informed the speaker that within the next ten years, some 3000 lumber mills in the Southern States would be forced to go out of business as the supply of Southern Pine would be gone.

In conclusion Mr. Price-Greene drew the attention of the members to the development of possible substitutes for pulp in making certain kinds of paper. He personally was much interested in a process recently successfully operated at a plant in the United States, where straw was used instead of pulp, producing an excellent grade of paper at about one-half the cost.

A vote of thanks to Mr. Price-Greene moved by Mr. J. P. Murray, and seconded by Mr. Van der Linde, was unanimously carried.

In calling the meeting to order following the usual dinner, and just previous to Mr. Price-Greene's address, Chairman Ardagh referred to the public ownership of the railways and advised patience and less pessimism as the correct attitude to maintain towards railways operated in this manner. There was too much pessimism in evidence in the attitude of many toward governemnt owned railways. As with most things of that nature, the safe course was the middle one, neither too pessimistic or too optimistic, said the Professor.

A reply from the Minister of Inland Revenue, Ottawa, regarding the memorial of the Toronto Branch presented to the Government asking the Government to assist in the passing of the Excise Free Industrial Alcohol Bill was received. In his reply the Minister stated that all possible consideration would be given to the memorial of the Toronto Branch.

Mr. L. E. Westman for the Exhibition Committee reported that the prospects appeared favorable for an exhibit at the Canadian National Exhibition, and as regards the exhibits at the Convention of Canadian Chemists, May 27-28, Toronto, already sufficient space had been taken by exhibitors to fill the whole corridor at the Mining Building.

This being the annual business meeting of the session, the nominating committee coposed of Dr. Lash Miller, Mr. V. Van der Linde, and Mr. Thurlow, presented the following names as constituting the Executive Committee for the session 1920-21, which were unanimously elected to stand thereon:—Professor E. G. R. Ardagh, L. T. Acton, Professor J. T. Burt-Gerrans, Mr. M. L. Davies, Mr. A. J. MacDougall, Mr. J. P. Murray, Mr. T. E. Rothwell, Mr. H. Van der Linde, and Mr. L. E. Westman as active members, and Messrs. Sale and Sinmett as representing the Assaciate members.

OTTAWA BRANCH OF THE SOCIETY OF CHEMICAL INDUSTRY.

Dr. J. A. Amyot, Deputy Minister of Health in the Federal Government, was the speaker at the last meeting of the Ottawa Branch of the Society of Chemical Industry, the subject of his address being "Procedures Used in the Examination of Waters of the Great Lakes during the Pollution Investigations of 1913." After a few introductory remarks, in which the speaker outlined some of the causes of the pollution of rivers and streams, he delved into his subject, and for an hour or more held his hearers' attention while he unfolded to them the interesting story of the work done during 1913 by the Canadian and United States members of the Investigation Commission. Dr. Amyot developed his subject carefully, beginning with a historical review in which he described the conditions prevalent in the various countries of Europe and the States of the Union in regard to water supply. After referring to the turbid waters found throughout the Central and Southern States, and the brown, peaty waters of Northern Ontario and Quebec, he came to the discussion of the crystal waters of the Great Lakes, and dwelt on the fact that it was difficult to convince people that such clear, transparent water could possibly be polluted. The typhoid rates were high, however, and for a long time public health officers had known that the water was to blame. He then proceeded to outline in detail the methods followed in the examinations which were made the subject of his address. Thousands of samples from and under the surface of the waters were taken and subjected to a bacteriological examination. The results from a definite series of samples were checked against a corresponding series taken by the United States members of the Commission, and remarkably good checks were obtained in this way. The lakes and rivers were charted so that samples were obtained in every possible desirable way, and comparisons of analyses were only made over long series of samples.

A discussion followed, led by Dean Goodwin, Chairman of the Canadian Section of the Society, who spoke in his usual happy way. A number of others also discussed the subject from their various points of view and thus added greatly to the general value of the meeting.

The chairman, Dr. Shutt, announced that the next would be the annual meeting of the Ottawa Branch, and the Committee had arranged that a social evening should be spent, the only items of business coming up to be the Secretary's report for the year and the election of officers for the ensuing year, and, as the Committee had already appointed a nominating committee, this latter item would not prove burdensome. Refreshments were promised and the members and their friends were all invited to be present.

MORE SODIUM SULPHATE LOCATED.

Another deposit of natural salt has been located in Southern Saskatchewan, which on analysis, as reported, shows from 98 to 99 per cent. of sodium sulphate, with a slight trace of common salt and potash. The deposit is situated in townships 4, R. 21, W. 2nd, and lies in the form of a lake bed about four miles in length, and from 200 to 900 yards wide. Drilling has been carried on, so far, to a depth of 16 feet. The deposit is, apparently, something similar to the one at Muskiki Lake, described in this Journal in the December, 1919, issue. While full investigations have not been made, it would appear that the possibilities for obtaining large quantities of sodium sulphate from the deposit are good, but we shall await more complete data with interest.

INDUSTRIAL SECTION

Construction, Manufacturing and Market News

British Columbia.

Vancouver.—The Alunite Mining and Products Co., Ltd., of Victoria, have leased four lots on Granville Island on which they propose to erect a glass factory, and expect to begin operations within four months time.

Lord Leverholme, president of Lever Bros., the well known soap manufacturers, while in Vancouver recently put through negotiations for the purchasing of a large water-front site on Vancouver Harbour. The company propose to build a factory as an addition to their present local plant, also building wharves and warehouses.

A plant is being operated on Rendezvous Island by Mr. Johncox for the manufacture of fish oil and fertilizer from dog fish, fish scraps and refuse from the canneries. Another plant for the same purpose is being erected by Mr. J. B. Jardine, and operations are expected to commence shortly.

Sidney.—The Sidney Rubber Roofing Company of Sidney, B.C. has arranged a loan from the B.C. Government for $100,000, the loan being applied chiefly for the erection of a pulp and paper mill.

Manitoba.

Winnipeg.—The Prest-O-Lite Co. of Canada, Ltd., are erecting a two-storey battery warehouse and assembly plant on Tache Avenue; estimated cost $25,000.

New Brunswick.

Fredericton.—John Palmer Co. Ltd., tanners and manufacturers of oil footwear have now in operation the new wing to their factory, 50 x 100 feet, three storeys and basement.

Ontario.

Brockville.—Additions are being made to the plant of the International Metal Works, Ltd., here, in order to handle increased business in auto sheet metal parts.

Cobalt.—Improvements are being made to the barite mill of the Premier-Langmuir Company who control a barite mine near Nighthawk Lake, and when completed shipments of barite ore will be resumed. R. H. Cullis of London, Ont., has been elected President of the Company in place of Mr. McIntosh who has retired.

Deseronto.—The Quinte Chemical Co. Ltd., was incorporated in February, 1919 for $40,000, and their plant here is nearly completed. The Company expect to begin operations this Spring if finances can be arranged. The Company propose to distill juniper oil from the juniper bush and berry, and cedar oil from the cedar bush. The plant will have an initial capacity of a ton of bush per day, which by the addition of another still can be increased to two tons per day. The plant is over 100 feet long by 30 feet wide, with other buildings for laboratory, office and shop. The production capacity will be at least 40 pounds per day. The President of the Company is Col. W. T. Malley, and the Secretary is Geo. F. Palmer.

Deseronto is the location of a new powder industry known as the Thompson Powder Company, who expect to commence operations this month in the manufacture of their new explosive called "Thompsonite" which, it is stated, does not give off noxious fumes, and does not require thawing even in the coldest weather, also other qualities which, it is said, will commend it to mining men and contractors. The executive officers are President and General Manager, J. D. Thompson; Vice-President, H. C. Anderson; Secretary, J. A. Griffith.

Galt.—Construction is proceeding on two additions to the plant of the Galt Brass Company at a cost of $50,000, one a new nitro building, and the other a new foundry.

Meaford.—The Meaford Steel Products Company, a new organization, has taken over the operation of the Meaford Wheelbarrow Factory, the largest plant of the kind in Canada, which has been closed down since the latter part of 1916, and have resumed operations with a full staff. Wheelbarrows, trucks, scrapers and platform scales will be produced. The officers of the new organization are: President, James A. Brown, London, Ont.; Vice-President and Manager, E. S. Cleland, Meaford; Sec.-Treas., James S. Reynolds, Sault Ste. Marie, Ont.; Directors, George Fox, London, Ont.; and Dr. F. A. Cleland, Toronto.

Sydenham.—Bowes Milk Products, Ltd., are erecting a factory here for the manufacture of powdered milk, estimated cost $175,000. It is expected to commence operations this month. There is said to be a milk supply of 150,000 to 200,000 pounds per day within a radius of twelve miles.

Thorold.—Additions to the plant of the Pilkington Glass Works, the largest glass factory in Canada are nearing completion. The volume of production turned out by this plant is increasing rapidly every year and the management believe that within a few years the plant will give employment to upwards of 8,000 employees. A village of modern workmen's homes has been erected near the plant by the company known as "Windle Village" which is growing in size. A concert, dancing and recreation hall, field sports, etc. provide a wholesome social life for the employees.

The Beaver Board Company have removed their board mill from Ottawa to their plant at Thorold. At Thorold a new finishing plant 125 x 362 feet has been built, giving an output of 5,000,000 square feet of finished board per month, which will likely be increased.

Timmins.—The Cassel Cyanide Co. of Glasgow, Scotland, have made application for the incorporation under both Dominion and Provincial charters of a company to be known as the Cassel Cyanide Company of Canada, Limited, to handle the Canadian business of the company. Head office will be at Montreal, and Ontario headquarters at Timmins. The directors will be Sir George Beilby, F.R.S., Glasgow; Col. Sir Edward Allen Grotherton, Bart., M.P. for Leeds; William Neill, Glasgow; Rupert G. Bruce, Toronto; Major Fred. A. Reacock, Montreal; and William Evan Simpson, Boston Creek.

Toronto.—Plans have been prepared and estimates received for the erection at the corner of Wallace and Ward Avenues, Toronto, of a new four storey factory for the

Canadian General Electric Company. The estimated cost is from $250,000 to $300,000.

The Toronto Carpet Manufacturing Co. are erecting a new dyehouse.

Sheet Metal Products, Limited, have been granted a permit for an additional storey to their warehouse on River Street, and for the erection of a new four-storey warehouse at Bell and River Streets.

Waterloo.—The International Engineering Corporation propose to erect a factory here at a cost of about $45,000 with machinery to cost $50,000 in return for a loan of $75,000 from the town and a free site. The Company's product will be crude oil engines. The matter is under consideration by the municipality.

Welland.—The Ontario Smelters' and Refiners, Limited, of Chippewa have bought the plant of the Metals Chemical Company here, and intend enlarging it and making the necessary changes for the carrying out of processes to recover the silver, nickel, arsenic, copper aud antimony from Cobalt ores. The company intend shortly to manufacture most of the chemicals required in the treating of the ores. The plant as operated by the Metals Chemical Company produced Cobalt sulphates.

The Volta Manufacturing Company has been recently re-incorporated for $1,200,000. No change in the personnel of the company has been made. Electric furnace regulators are in heavy demand in Canada, and the company expect their plant to be kept busy handling home needs alone, and will also probably develop the export field.

Woodstock.—The Ontario Cement Co., Ltd., have acquired the physical assets of the Ontario Portland Cement, Ltd., whose plant was located at Blue Lake, are erecting an 800-barrel mill at Beachvill, between Wood Ingersoll, where valuable deposits of clay and limestone are located sufficient to supply a 1500-barrel mill for 50 years at least. It is expected to have the plant in operation by August 1st, and in the meantime the plant at Blue Lake will be reopened and raw material drawn from the Beachville property.

Woodstock.—The Independent Concrete Pipe Company, Ltd., have taken over the plant of the B. Blair Company, the plant having been considerably enlarged and improved. Pipe can be turned out in sizes from 6 to 108 inches in diameter.

Windsor.—The Canadian Postum Cereal Co., Ltd., will erect an addition to their Grape-Nuts process building practically doubling the capacity.

Quebec.

St. Hyancinthe.—The Canadian Manhasset Cotton Company have nearly completed their large spinnery mill and weaving plant for the manufacture of tire fabrics. The plant will have a capacity of over 40,000 pounds of tire fabric per week, and by next Fall this will be increased to 80,000 pounds.

OPENS MONTREAL OFFICE.

The increasing import and export business at Toronto and Montreal in chemicals, oils and allied products, is responsible for the opening at Montreal of an office by Mr. Wendell H. Lawson, who for some time past has conducted an importing and exporting business at 32 Front Street West, Toronto. After May 1st, Mr. Lawson will make his headquarters at 3 St. Nicholas Street, Montreal, retaining his Toronto office at the same address as heretofore for the benefit of Toronto and Ontario customers.

CHEMICAL OPERATIONS AT TRENTON.

The acquiring by the Chemical Products, Limited, Toronto, of the plant at Trenton, Ont., formerly owned by the British Chemicals, Limited, and operated by the Imperial Munitions Board during the war, was announced in this journal some months ago, and now more detailed information is available.

Additional construction work has been going on at the Trenton plant with a view to the production of soluble phosphates, pharmaceutical and other chemicals. It is proposed to divide the plant into four units, the first section to be sulphuric acid plant, to be operated largely for fertilizer production. The nitric acid plant will be used later with a view to producing mixed acids for explosives, dyestuffs, intermediates, etc. Plant No. 2 is proposed for the manufacture of refined nitrate of soda, Epsom salt and general chemicals. In plant No. 3 it is planned to make salicylates and allied derivatives, namely, aspirin, salicylic acid, sodium salicylate, oil of wintergreen, cresotinic acid, etc. The production of ammonia and coke oven by-products is contemplated in plant No. 4, including salammonic, ammonium carbonate, liquor ammonia, aromatic hydro carbons and whiting.

Aspirin was successfully produced on a commercial scale during the war by the Chemical Products of Canada, Limited, in its Toronto plant. The market offered for this product is very large, and it is believed that from 600 to 800 tons per year can be handled from the Trenton plant. With respect to prospective markets it is stated that two firms in England are willing to contract for delivery of 500 tons annually in bulk. A company in Argentina asked for quotations on 50 tons, and Australia, it is expected, will consume 100 tons a year. Russia will be perhaps the largest user of aspirin when that country is again opened up for international trade. China is also a very promising market. Hitherto small quantities in retail packages have been taken for Chinese consumption, but Chemical Products have authoritative information that there is a tremendous field as soon as a manufacturer can offer quantities in bulk at a reasonable figure.

It is proposed to produce salicyclic acid in excess of the aspirin and salicylate requirements. This chemical was produced exclusively in Germany before the war. It is used largely in the pharmaceutical trade for remedial preparations and the dyestuff trade, etc. World consumption is estimated at 3,000 tons a year.

With respect to refined nitrate of soda, the Chemical Products management state that they have now on order contracts covering about 3,000 tons. Nitrate of soda has replaced the ordinary saltpetre in the treatment and curing of meats.

Acid phosphate, for fertilizer purposes, will be produced in the fertilizer section. Canadian requirements of acid phosphate are estimated at considerably in excess of 50,000 tons a year. There is at present, according to recent calculation, a world shortage of this material of 15,000,000 tons, with no prospect of meeting the full demand for several years to come. The demand for acid phosphate for Canadian purposes will, fertilizer consumers predict, expand greatly in the next few years.

The capacity of the sulphuric acid plant at Trenton is estimated at 120 tons per day.

Chemical Products, Limited, is the name of the new organization, formerly known as Chemical Products of Canada, Limited. About 50 per cent, of the output of the Chemical Products of Canada from 1916 to 1918 was for

export and the newly formed organization plans to follow along similar lines.

The Chemical Products of Canada, Limited, which the new organization succeeds was a purely Canadian concern organized in 1916, with plant at 148 Van Horne St., Toronto, and accomplished a great deal in spite of the fact that it was considerably hampered for raw materials because of war conditions. This company laid the foundation stones and ground work for the new Trenton enterprise. The sales of this company in goods of its own manufacture were in excess of $800,000, more than 50 per cent. of which repre sents export to foreign countries. The men responsible for success of this company were, T. E. O'Reilly, W. H. Vanwinckel, and A. H. C. Heitman.

The directors of the new organization, Chemical Products, Limited, are: R. J. Copeland, of Copeland-Chatterson, Limited, Vice-President of Thermos Bottle Company, Limited; D. M. Sanson, of Graham, Sanson & Co, Investment Bankers, Toronto, President of Dominion Linens, Limited, and of Flax Spinners, Limited, of Guelph, Ont., and Vice-President of William Neilson, Limited, Toronto; R. J. Cluff, President of Chase Tractors Corporation, Limited, and of Loews Theatres, Limited; J. C. Groves, President and General Manager Saginaw Chemical Co. of Saginaw, Mich., formerly General Superintendent of the Dow Chemical Co., Midland, Mich.; T. E. O'Reilly, Sec.-Treas. of T. E. O'Reilly, Limited, Toronto, and formerly President of Chemical Products of Canada, Limited, Toronto; W. H. Vanwinckel, Vice-President of the Aniline Dyes and Chemicals, Inc., New York, N.Y., formerly Sales Manager of the Dow Chemical Co., Midland, Mich.

The manager of the Trenton plant will be Mr. A. H. C. Heitman, an experienced and successful chemical plant operator. Mr. Heitman's activities have included, two years on the staff of the Milwaukee Medical College, ten years in the Research Division of Parke, Davis & Co., Detroit. After severing his connection with Parke, Davis & Co., he came to Canada and successfully installed the chemical division of the Cott-A-Lapp Co., Limited, at Walkerville, Ont., where he instigated the manufacture of salicylic acid, this being the first and only successful plant to produce salicylic acid in America, with the exception of the original German plant at Garfield, U. S. The Walkerville plant was operated with such success that it was bought out in its entirely by the Calco Chemical Co., of Bound Brook, N. J., with the expectation that Mr. Heitman would join the organization in New Jersey. However, he was confronted with a request to remain in Canada and join forces with the Chemical Products of Canada, which he did, becoming managing director.

Chemical Products, Limited, are capitalized at $2,000,000.

NORTHERN ONTARIO NOTES.

There has been considerable activity of late in both gold and silver mining in Northern Ontario, and it would appear that a period of safe, progressive developments of these rich mineral deposits has at last commenced. The time of the "wild-catter" and of more or less fake concerns has passed, and the gold and silver deposits of Northern Ontario are now being developed by, take it on the whole, as reliable a group of mining organizations as ever operated in any field. The Associated Gold Fields Company, though only at work on their claim at Larder Lake for a little over a year have commenced the construction of a thousand ton mill and have partially developed two big lenses of ore running $11.15 a ton. The Davidson Gold Mine at Timmins is expending about $18,000 per month on development work. At a depth of 500 feet, the drift westward on the vein has been carried for a distance of 460 feet, the width varying from 27 to 53 feet all containing, however, ore of commercial value. It is probable that the Davidson will put down a new shaft considerably north of the present one in order to reach the ore bodies now disclosed. The company also propose to establish a large modern mill with a cyanide installation, work on which will probably commence within the next few months. The Hollinger Mine, of course, ranks today as the greatest gold mine in the world, without an exception. There is nothing in South Africa to equal it, yet few Canadians realize this. Matachewan, Gowganda, and Shining Tree comprise a rich mineral area.

It is reported that the Canadian National Railways might consider a scheme to tap the West Shining Tree and Gonganda mineral areas.

A number of properties are now in an advanced state of development in this district, and Wasipika, Atlas Gold and Herrick will probably be erecting mills before the end of the year. One plan of railway construction advocated by some mining men involves about 75 miles of new construction from Swastika on the T. & N. O. Railway to Westree on the Canadian National.

FIRMS SECURE DYES.

The British Board of Trade have allocated 2,240 pounds of German dyestuffs to Canadian firms, this being part of Canada's share under the reparation clauses in the Peace Treaty. The Board has also pointed out possible British sources of supply from which further Canadian requirements may, it is hoped, be satisfied.

The following firms have been allocated dyestuffs:— Cobourg Dyeing Company, Mercury Mills, Toronto Carpet Manufacturing Company, Belding Paul Corticelli Company (Montreal), Dominion Textile Company, Monarch Knitting Company, Penmans, Regent Knitting Mills, Budge Carbon Paper Manufacturing Company (Montreal).

MONSANTO CHEMICALS TO BE MADE IN ENGLAND.

The Monsanto Chemical Works, Inc., announce the establishment in Great Britain of the Graesser Monsanto Chemical Works, Ltd. This firm is the amalgamation of the British interests of Monsanto Chemical Works of St. Louis, Mo., U.S.A., with the old esatblished firm of R. Graesser, Ltd., of Ruabon, N. Wales

R. Graesser, Ltd., have been leading manufacturers of phenol and cresols since their establishment in 1857. The new firm with a fully paid up capital of £400,000 will immediately commence to manufacture in Ruabon, the full line of chemicals manufactured by Monsanto Chemical Works in America, The new Company will take over the London offices of Monsanto Chemical Works at 62 London Wall, London, E. C., 2, from which office all Eruopean sales will be handled.

Mr. Robt. DuBois, former sales manager of Monsanto Chemical Works, will continue to manage the London office and a number of others from the staff of Monsanto Chemical Works are already located in the Ruabon plant.

Mr. J. P. Strachan is vacating his position as chemical engineer with the Canada Paper Co. at Widnsor Mills, Quebec, and has received an appointment as assistant superintendent with the Bagalusa Pulp & Paper Co., Inc., at Bagalusa, Louisianna, U.S.A.

BRITISH COLUMBIA NEWS.

(From Our B. C. Correspondent.)

Investigating Platinum Possibilities.

The British Columbia Government has decided to make a thorough investigation of the possibilities of finding platinum in commercial quantities in what is known as the "black lead" at the Franklin Camp, which is situated on the Kettle River, 41 miles north of Grand Forks, and, with that end in view, has let a contract for a considerable quantity of diamond-drilling to Messrs. Mitchell & Co.

In 1918 the Munition Resources Commission instructed Mr. William Thomlinson, of New Denver, to make an investigation of the platinum resources of the province, and particularly of the pyroxenite belt, or so-called "black lead," which extends almost the entire length of the Franklin Camp. A number of copper claims have been staked on this belt, and some ore has been shipped to the smelter from them. The copper occurs principally as chalcopyrite in bunches and veinlets through the pyroxenite and often extend into the syenite, on the hanging wall. Mr. Thomlinson took a number of samples from the workings of the Maple Leaf property, and, as some of these gave such interesting results—running up to 0.38 ounces of platinum per ton—he decided to sample the other properties on the belt. The best results, however, were obtained from the Maple Leaf property, and it is btween it and the Gloucester property that the Government will start drilling operations.

At the Maple Leaf the platinum seems to be concentrated in the chalcopyrite, but whether it occurs as native metal or as the mineral sperrylite has not yet been determined. At the Gloucester, on the other hand, the platinum seems to be associated with sulphides of iron, while at the Mountain Lion claim it was found associated with both oxides and sulphides of iron. The former, however, is probably a product of oxidation of the latter, but the presence of platinum in both shows the necessity of testing practically all the metallic minerals for that metal.

In his report Mr. Thomlinson gives the result of assays of 15 samples that were taken from different properties on the pyroxenite belt, and these run from 0.02 up to 0.38 ounces of platinum per ton. In making the assays no attempt appears to have been made to separate the various metals of the platinum group, and it is probable that the whole group was reported as platinum. This is important, of course, because, though palladium has about the same market value as platinum, iridium, which often occurs with platinum, is quoted at $300 per ounce, against $145 per ounce for platinum.

Important Mining Legislation.

The present session of the Provincial Parliament, which is sitting at the time of writing, is passing and has passed a considerable amount of legislation, which is of the deepest interest to mining men and metallurgists. An amendment to the Iron Bounties Act extends the date from December 31, 1923, to December 31, 1925, up to which date the British Columbia Government will pay a bounty of $3 per ton on pigiron made in the province from B. C. ore, and, in the event of mixing with foreign ores, $1.50 per ton for iron made from the foreign ore. The bounty, as on pigiron under this Act, may be paid upon molten iron in the electric or other furnace or Bessemer converter, the weight of such iron to be calculatedfrom the weight of steel manufactured.

An amendment to the Mineral Survey and Development Act provides that when a joint stock company acquires an interest in, or engages in work on any mineral claim situated in a mineral survey district, it must forthwith notify the resident engineer of that district and file with him full particulars thereof and a copy of the prospectus that is required by the Company Act. This Act has been passed with the view to preventing "wildcatting" and of insuring that moneys subscribed by shareholders shall be invested in the properties, and not simply go into promoters' pockets, as has been done on more than one occasion in the past.

An amendment to the Mineral Act provides for the withdrawal from location, by notice in one issue of the B. C. Gazette, of lands containing iron ore which do not form a part of any existing mineral claim, and for the disposal of the iron ore on such lands by the Lieutenant-Governor-in-Council. The present Government seems to have at last realized the necessity for the establishment of an iron and steel industry in British Columbia, and that its establishment has been retarded by people who have held iron properties for speculation without doing any work on them. In some instances properties have been held in this way for nearly 20 years, and it is to prevent this in the future that this Act has been passed.

Coal lands have been withdrawn from location in the same way by Order-in-Council.

The Engineers' Profession Act, which has passel its third reading, has caused a considerable amount of comment from mining men. It provides that only members of the association shall be allowed to practice in British Columbia. Certain exceptions are made, including, among others, examining engineers, that is, engineers investigating mining and other propositions with the view of giving advice as to the value of properties. It has been pointed out by mining men that the passage of this Act may prevent the investment of foreign capital, particularly in the case of large mining companies that have trained staffs of engineers and who are not likely to invest in properties unless operations are conducted by their own engineers.

Changes in the Placer Mining Act provide for a reduction in the minimum annual expenditure and also a reduction in the rentals of placer leases, and in the event of failure to fulfil the conditions the leases will be forfeited automatically. At the present time some $303,000 of accrued rentals on placer leases is owing to the Government. The bill provides for payment of these back rentals over a period of ten years, and in the event of their not being paid within that time the leases will be forfeited.

Mining Notes.

The northwestern section of the province is still commanding considerable interest. The case of the Dolly Varden Mines, Ltd,, vs. the Taylor Mining Co., will be settled by April 11, when the time-limit expires. In the event of the Federal Department of Justice disallowing the local Act, by which the mine was transferred from the Dolly Varden to the Taylor Company, it is generally accepted that the present session of the local Legislature will re-enact the legislation over Ottawa's veto. As soon as the case is finally settled, the Taylor Mining Co. will erect a concentration plant, and possibly a cyanide plant, at the mine. E. H. Nutter, of the Minerals Separation Co., recently paid a visit to the mine to advise on the nature of plant required. In the early part of April the main tunnel cut the ore-body at a depth of 500 feet. The ore

assayed 80 ounces of silver per ton at the point where the tunnel cut it.

The Premier mine has been shipping ore running in the vicinity of $275 per ton steadily since the beginning of the winter. At the time of writing the machinery for a concentrating plant is being hauled to the mine, and two of the American Smelting & Refining Co. engineers have gone to Stewart to superintend the erection.

The Calumet & Arizona Mining Co. has purchased the Cornell group, on Texada Island. The company has had the property under option for two years. The old shaft is being unwatered.

The D'Arcy Exploration Co., a subsidiary of the Anglo-Persian Oil Co., is again making application to the Provincial Government for the exploratory rights for five years over a block of oil lands 60 miles square in the Peace River region, with the right to select one-tenth of the area for operation in the event of oil in commercial quantity being discovered. In the event of the discovery of paying quantities of oil, the company agrees to build a pipe-line to the coast and to pay a royalty of one-eighth of the value of the oil at the casing head. A similar application was made and denied about a year ago, but, as the present application is backed by a request for its consideration from the Colonial Office because the finding of oil would assist the British Government in providing oil-fuel for the Royal Navy and the mercantile marine, it is more than likely that the concession will be granted.

The Granby Consolidated Mining, Smelting & Power Co. is negotiating with the Boeing Airplane Co., of Seattle, for the construction of three hydroplanes in which it is proposed to carry ore from one of the company's interior mines to tide-water at Stewart. Each machine is to weigh about 3,600 pounds, to be equipped with a 220 horse-power Liberty motor, and to have an ore-carrying capacity of 1,000 pounds. At the present time the transportation of ore from the mine to tide-water costs fifteen cents per pound, the ore having to be carried over tortuous mountain trails by pack horses. By the new method of transportation the management of the company expects to cut this cost in two. Lieut. Ernest Hall, late of the Canadian Flying Corps, has been engaged to operate the first machine, which, it is expected, will be put on the route some time during April. If it proves a success the other two machines will go into commission in June.

Robert A. Bryce and Ontario associates have suspended operations on Proserpine Mountain, near Barkerfield. The property, which was bonded last fall, was supposed by many to be the mother lode of at least part of the famous Cariboo placer deposits. It is an immense body of quartzite intercalated with stringers and small veins of quartz, the latter carrying the gold, and Mr. Bryce undertook the exploration with a view to discovering if these veins and veinlets were sufficiently rich in gold to allow the whole ore-body to be worked as a huge low-grade proposition. Some fifty to sixty men have been employed during the fall and winter in tunnelling, open-cutting and diamond-drilling.

It seems likely that the completion of the Pacific Great Eastern Railway will be the means of reviving interest in the Cariboo placer gold deposits. It is generally acknowledged that there are a number of deposits that are sufficiently rich to be worked by dredges, though too poor to be worked by other methods, but, in the past, the difficulty of transporting machinery over poor roads—if, indeed, they could be so called—has rendered dredging almost impossible. The P.G.E. Ry. is now running into Quesnel, and property is being staked with a view to operation by dredges. A. D. Whittier has taken up twenty-five miles of placer ground on the Quesnel River, starting at the junction of the Quesnel and Fraser Rivers, and will operate a dredge on that section this summer. The mining interests are endeavoring to persuade the local Government to run a branch line from Quesnel to Barkerville, with the object of reopening the placer deposits in that district.

The Consolidated Mining & Smelting Co. has made arrangements to treat the output of the Canada Copper Corporation's concentrator, at Allenby, which, it is expected, will amount to 130 tons of concentrate, with a copper content of about 25 per cent. per day. In order to meet this very considerable extra demand on its plant, the Consolidated Company is increasing the capacity of its refinery from the present capacity of 20 tons up to 50 tons of copper per day. Besides this the company is installing a rod mill at a cost of about $200,000. In the past Canada has imported practically all its rod and bar copper from the United States, the importation in 1918 totalling 14,796,200 pounds, valued at $3,787,521. With the new rod mill in operation at Trail a large proportion of the rod copper used should be produced in this country in the future. A large staff of extra draughtsmen have been employed, and the plans for the new concentrator to treat the copper-gold-silver ores from the company's Rossland mines is being pushed with the utmost speed. The Sullivan Mine is now producing all the ore that the 600-ton experimental concentrator is able to handle. Starting from February 16, the company has increased wages 50 cents per shift to all employees at all its mining camps and at its smelter.

Professor Gwillim's report on the oil possibilities of the Peace River country was tabled recently at the local House by the Hon. T. D. Pattullo, Minister of Lands. Mr. Pattullo stated that the work would be continued this year. It is not known whether the report will be published in its present form, or whether publication will be delayed until the exploration work is completed.

The Britannia Wire Rope Co. has been organized for the purpose of erecting a factory on Granville Island, Vancouver, for the manufacture of wire rope. The plans for the plant have been completed, and the machinery has been purchased in England, and now is on its way to Canada. The company has been financed by British capital, and nothing but British-made material will be used in making the rope.

Unusually rich silver ore, carrying heavy plate silver, has been struck at the Dolly Varden Mine at Alice Arm. About two and a half tons of this ore is being produced daily, and is being sent to tide-water, a distance of eighteen miles, by dog teams and pack horses. From Alice Arm it is sent to the Selby Smelter.

The long tunnel at the Nugget Mine, in the Nelson district, has cut its objective—the Nugget main vein. The vein was twelve feet wide at the point of intersection, and sixteen inches on the foot-wall assayed $17 per ton in gold, and three feet on the hanging-wall $33.60.

Katzenbach and Bullock, importers, exporters, and manufacturers of chemicals and colors, have removed their New York office from 100 William street to 440 Washington street, New York, and are now located in their new home.

Government Publications

By S. J. COOK

Commission of Conservation.

Tenth Annual Report and Wild Life Conference...278 pp. and 183 pp. 45 plates.

This is a verbatim report of the proceedings of the tenth annual meeting held at Ottawa in February, 1919. As the title indicates two reports are bound in the one volume, as in effect the Wild Life Conference was held at the same time as the annual meeting. The first part of the book is given to the chairman's address and the reports from the numerous standing committees, each represented in an address by one of the principal members. Mr. James White, Assistant Chairman and Deputy Head, presented a review of the year's work in conservation, touching briefly on each of the many activities of the Commission during the year. As an appendix to his address there is printed in full the Order-in-Council *re* the Application of the St. Lawrence River Power Co., the argument of the Hon. Hugh Guthrie, Solicitor for Canada, the Interim Order of the International Joint Commission, and the Order-in-Council of October 12, *re* St. Lawrence River Power Co., together with an article on the subject of Aluminum.

The report of the Town Planning expert, Mr. Thomas Adams, contains plans of the town of Kipawa and also those drawn up for the greater Halifax. Mr. Adams traces the growth of the town planning idea and deals with the subject of as it affects Canada. He has further articles on the relation of town planning to taxation and municipal government, and the progress made by the Civic Improvement League, in the matter of housing.

The Committee on Lands reported the work done towards improving farm methods looking to the proper conservation and development of our agricultural resources.

Conservation of our forest reserves is a topic on which much is written, not only by conservationists in official life, but by many others as well. With it all, it seems that something more effective might be the outcome, but it is possible that our resources are not yet sufficiently depleted to compel something more than talk to result. The annual report now reviewed deals with the subject, and reviews the surveys made by the Commission of the timber resources of Canada. This work has the approval of the Canadian Pulp and Paper Association. One of the items of interest to residents of Ontario is the reservation of $16,000 from the funds of the Commission for the continuation of field work in forestry in Ontario.

There are also reports on the power situation, medicine in war, and other and instructive reading to the general reader.

The plates are without exception, very good, and add much to the attractiveness of the volume.

The section given to the Wild Life Conference deserves rather more attention than is possible in this review. Suffice it to say, everyone who has the time and opportunity will find in its perusal pages of outdoor interest presented by masters in their various departments.

Department of the Interior—Dominion Power Branch.

Water Resources Paper. No. 24. Hydrometric Survey of Manitoba, for the climatic years 1916-17 and 1917-18. 173 pp. 3 illus. 1 map.

The Hydrometric Survey of Manitoba was organized in 1912, a successor to the Winnipeg River Power Survey, and as a subsidiary to the Dominion Water Power Branch of the Federal Department of the Interior. Its chief business is gathering of stream flow data and the making of power and storage investigations. The field covered comprises the whole of Manitoba, and, in addition, certain other investigations necessitate the extension of work to points outside the province, in order that all the factors having a bearing on stream flow within the province may be studied.

The report is one of those records of work done the value of which will be better appreciated in the future than it can be now.

Department of the Interior—Reclamation Service.

Report of Irrigation Surveys and Inspections. 1918-1919. 67 pp. 3 diagrams.

The branch of the department service formerly known as the "Irrigation Branch," was, by authority of an Order-in-Council dated December 31, 1918, superseded by "The Reclamation Service." This legislation is said to mark the successful conclusion of negotiations carried on for several years between the Dominion Government and the governments of the Provinces of Alberta and Saskatchewan for the reclamation of submerged or swamp lands by drainage and paves the way for a progressive policy whereby large areas of now worthless land in these provinces may be reclaimed and made productive. It is anticipated that the Manitoba Government with whom similar negotiations were carried on will before long enact legisation along similar lines.

This publication, which contains the reports of the Director of Reclamation Service and that of the Commissioner of Irrigation, also outlines what was done during the period indicated in the conduct of irrigation projects in the several districts. There are notes from the experimental irrigation farms and tables of data collected in many localities. As the natural precipitation varies from year to year, the nature of irrigation, as well as the amount, must be varied to suit the needs. It is customary to consider both the natural precipitation and irrigation water simply as so much depth of water applied to crops. The sum of these gives a figure which is readily comparable from year to year, although its accuracy is affected by the seasonal distribution and the temperature. The whole report is a resume of the work done along the lines laid down above, and proves very interesting matter for study by those who have in mind the problems of the West and needs of the country.

Water Supply Bulletin No. 10. Hydrometric Surveys in the Provinces of Alberta and Saskatchewan, for the year ended September 30, 1918. 341 pp. 1 plate.

The chief functions of a Hydrometric Survey are the collection of data relating to the flow of surface waters, and a study of the conditions affecting this flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation and water-power development, storage, seepage, etc., which may be of value in the development of water resources. This information is obtained by a series of observations at regular gauging stations which are established at suitable points. This bulletin is the published record of the work done in Manitoba and Saskatchewan during 1918 along the lines of investigation mentioned above, but it does not include work done on water-power development or irrigation, as these are fields of endeavor which belong to another branch of the same service with whom close contact is maintained.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Lead Salts.

Ralph M. Harrington, 199239, April 13, 1920. An electric current is passed from a Pb anode to a cathode through an electrolyte capable of yielding a Pb solvent.

Synthetic Acetylene from Organic Liquids.

G. O. Curme, Jr., 199197, April 13, 1920. Gases rich in C_2H_2 are produced from hydrocarbon liquids by forming a controlled electric power discharge within the body of the liquid and withdrawing and collecting the gaseous decomposition products containing C_2H_2. A high-frequency A.C. arc discharge is employed.

Silicon Carbide.

Otis Hutchins, 199208, April 13, 1920. SiC is made by heating a mixture of sand and coke to the required temperature by passing an electric current through a conducting core embedded in the mixture.

Propellent Powder.

A. J. Teeple, Jr., 198560, March 23, 1920.

Propellent Powder.

A. L. Broadbent and R. G. Woodbridge, 198563, March 23, 1920.

Electrolytic Caustic Soda Cells.

N. Statham, 198568, March 23, 1920. The salt solution is fed into the anode chamber of the cell where it is allowed to percolate through the cathode diaphragm into the cathode chamber and form electrolytic cathode liquor containing about equal quantities of dissolved caustic soda and salt.

Alloys Containing Nickel.

Michelo N. Salvati, 198506, March 23, 1920. Ni alloys are made by mixing the Ni with the other metal or metals in the form of an alloy with Zn.

Refining Metals and Alloys.

Michelo N. Salvati, 198507, March 23, 1920. Ingots or castings are improved by eliminating all the O from the metal mass by introducing as a selective deoxidizing agent into the mould a quantity of alloy constituent.

Roasting Ores or Concentrates.

Urlyn C. Tainton, 198528, March 23, 1920. Ores or concentrates, specifically Zn ores or concentrates containing Fe.

Purifying Aluminous Material.

Lewis E. Saunders, 198583, March 23, 1920. The impure aluminous charge is fused with a proportion of C approximating that theoretically required for complete reduction of the non-aluminous oxide, in the presence of 10% by weight of metallic Fe.

Aluminous Abrasives.

L. E. Saunders and R. H. White, 198581, March 23, 1920. A crystalized aluminous abrasive has therein material amounts of an acid-oxide (SiO_2, TiO_2) and an alkali, these components being so proportioned as to yield a relatively weak abrasive grain as compared with aluminous grain of like acid-oxid content but substantially free from alkali.

Producing Crystalline Alumina.

Ray H. White, 198584, March 23, 1920. In fusing Al_2O_3 in carbon hearth furnaces the reduction of the Al_2O_3 in the layer of the charge adjacent the hearth is overcome by fusing a non-uniform charge.

Process for Increasing the Solubility of the Potassium Content of Cement Kiln Dust.

R. J. Nestell, 198569, March 23, 1920. Coal-fired cement kiln is subjected to the action of water at 100° for a sufficient time to effect substantial conversion of the K compound to a form readily soluble in water, the residue is removed and the solution is evaporated to dryness.

Hydrogen Peroxide.

D. Levin, 199059, April 6, 1920. H_2O_2 is prepared by electrolyzing a bisulfate to produce a persulfate, filtering the persulfate, preferably through an earthenware filter, to remove anodic particles, separating the H_2O_2 by film distillation, purifying the electrolyte with H_2S and re-electrolyzing the electrolyte.

Electrolytic Production of Zinc.

G. H. Clevenger, 197012, February 10, 1920. In the electrolytic production of Zn, Co is removed from electrolytes containing Mn by precipitating the Co with an oxidizing agent such as manganate or permanganate.

Electrolytic Recovery of Zinc.

G. H. Clevenger, 197018, February 10, 1920. In the electro-deposition of Zn, Co. is removed from the electrolyte by effecting the formation of nitroso-beta-naphthol with $C_{10}H_7OH$ and $NaNO_2$ within the electrolyte and proportioning the Co therewith.

Chemical, Oil and Metal Markets

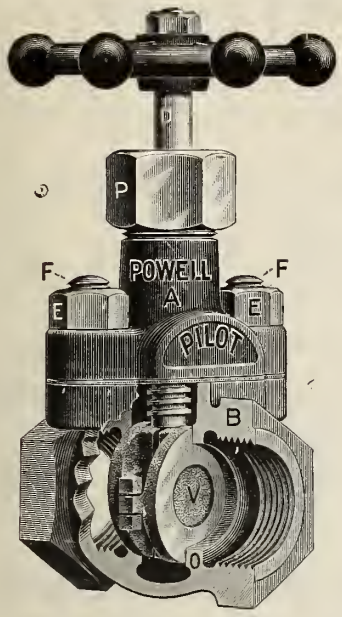
The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

An active period is holding sway in the chemical market of Canada at present, and the middle of May sees some good sales going through, though there is a decided shortage in several chemicals. This shortage is due, naturally, to a lack of supply and a heavy demand. The logical result of the shortage has been, of course, a rise in prices. Calcium chloride has advanced $5 a ton, and the prevailing price is $40 per ton with no warrant of definite delivery. There is a strong market in caustic soda, which is quoted at 7½ to 8½ cents per pound, a rise of a cent per pound during the past month. Oxalic acid has jumped away up, nearly 15 cents, and what orders can be filled are securing from 50 to 55 cents, though a few were reported at 45 cents. The scarcity of potassium permanganate is very marked, and none can be got under $1.35 per pound.

Pharmaceuticals.—There is a somewhat quieter tone to the pharmaceutical market, though on account of shortage several lines have advanced. This is very noticeable in citric acid, tartaric acid, and the bromides. Citric acid is quoted at $1.35 per pound, an unusually high mark for citric, and there is no prospect of a decline for some time, as supplies are short. On the other hand, quinine and camphor are down, the former having dropped from $1.02 to 90 cents on large orders, and from $1.50 to $1 on the pound.

Dyestuffs.—Dyestuffs continue at their high price level, and their cost is steadily increasing. This is due largely to the high price of such basic materials as napthalene, benzene and methyl alcohol. Dyestuffs instead of decreasing in price, following the war, are advancing continually. The price of napthalene to the dyestuff manufacturer is dependent upon the market price of creosote oil, which is a crude form of napthalene, and the present demand for creosote oil is so great that the manufacturers of napthalene claim that they could get more profit by not refining the napthalene from the crude oil at all, and that they do so simply to take care of the dyestuff requirements. The same holds true as regards benzene, the price of which is really dependent on the price of gasoline for fuel purposes, as the market for benzene in this connection in a mixture with gasoline is the determining factor as far as the benzene market is concerned. In fact, the amount of benzene consumed by the dyestuff trade would not even warrant the recovery of it to any extent by the use of by-product coke ovens, and it is only the large amount used for motor fuel that makes the use of the by-product coke oven pay; otherwise the bee-hive oven would do as well. Methyl alcohol, also used largely in the dyestuff industry, has advanced greatly in price recently, due to lack of production, for which various industrial conditions are to blame. The present outlook in the dyestuff market is therefore for increased prices, due to the advancing prices of many of the materials used in their manufacture.



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CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Alum, Ammonia, lump and ground	100 Lbs.	.. — 5.00
Aluminium Sulphate, high grade, bags	100 Lbs.	3.25— 3.50
Ammonia, Aqua 26	Lb.	.10½— .16
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.18— .25
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	.. —40.00
Camphor Monobromate	Lb.	.. — 5.75
Carbon Bisulphide, in drums	100 Lb.	.12— .13
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, bbl.	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.02¼—.02½
Copperas (Iron Sulphate) sugar	Lb.	.. —.02½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.11¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Hydrofluoric Acid, 60%	Lb.	.. — .25
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.05— .06
Mag. Sulphate, B.P., Medicinal	Single Ton	.. —75.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	.. —65.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.15
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash) Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — 1.35
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.45— .55
Sodium Bisulphite, powder	Lb.	.. —.08½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.00— 2.25
	Per Cwt. in Car Lots	.. — 1.60
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.. —.08¼
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting	Per Ton	25.00—30.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½

Organic.

Acetanilid, C. P.	Lb.	$ .. — .70
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.04½—.05½
Acetic acid, refined	Lb.	.18½—.19½
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.25— 1.35
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.50— .60
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.. — .85
Formaldehyde	Lb.	.65— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Glycerine, drum, C.P.	Lb.	.. — .28
Oxalic Acid	Lb.	.45— .55
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.25
Quinine	Oz.	.90— 1.00
Saccharin	Lb.	5.00— 5.50
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .42
Tartaric Acid, crystals or powdered	Lb.	.78— .80

Tanning Materials.

Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.32— .40
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Fluorspar, ground	Ton	.. —30.00
Fluorspar, ground	Lb.	.. — .06
Fluorspar, lump	Lb.	.. — .05
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.11½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.35— .40
Platinum, pure	Oz.	.. —170.00
Silver, bar	Per Troy Oz.	.. — 1.45
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .73
Zinc, sheets	Lb.	.. — .22

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .37
Motor Gasoline (service stations)	Gal.	.. — .40
Lighting Gasoline	Gal.	.. — .42
Naphtha	Gal.	.. — .36
Coal Oil	Gal.	.. —.24½
Fuel Oil	Gal.	.. — .12
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.15
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .18
Alpha-Naphthylamin	Lb.	.45— .50

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Spirits of Turpentine, in bbl. lots	(Imp.) Gal.	.. — 3.65
Rosin, Grade G, in 280 bbl. lots		.. —23.00
Rosin, Grade W.W., in 280 bbl. lots		.. —27.00

Gums and Vegetable Oils.

Vegetable Oils—		
Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .30
Castor Oil (Commercial), in bbl. lots	Lb.	.25— .27
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	.. — 2.87
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	.. — 2.90
Gums—		
Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .21
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

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Steamed Bone Meal	Per Ton	—45.00
Pure Ground Blood, per unit of Ammonia		— 7.50
Animal Tankage, per unit of Ammonia		— 7.25
Animal Tankage, per unit of Bone Phosphate of lime		— .10

Coal Tar Colors.

Acid Colors.

	Per Lb.
Azo carmine	$ 6.75
crimson	2.80
cyanine 5R	3.40
navy blue	—
rubein	3.10
yellow	3.40
Amaranth O	3.95
Black	1.80
4B	1.70
NBR	1.70
Blue, concentrated	6.75
B	6.20
R	4.50
4B	7.85
G	13.50
Bordeaux	2.25
Brilliant red	4.10
Brown	2.80
B	2.80
Carmoisine	3.10
Chinoline yellow	6.75
Croceine scarlet	3.95
scarlet R	1.15
scarlet 3B	3.40
Cyanine blue	5.60
Cyanol blue	20.70
Diamond black	3.40
Eosine	8.95
B	11.20
J	7.85
Fast red A	2.25
red E	2.80
blue	5.60
brown, red shades	4.75
crimson	4.50
neutral gray	4.10
Ponceau orange 2G	3.10
red	2.80
light yellow 2G	3.65
yellow G	2.80
Green	3.40
2G	13.50
Magenta, acid	11.20
Maroon	3.40
Metanil, yellow	2.80
Naphthol blue 3K	14.00
green	5.60
yellow S	2.50
Naphthylamine red	7.85
Navy blue	6.75
Orange A	1.15
K	1.15
Patent blue	39.20
Pink	6.75
Red	6.45
4B	2.50
Scarlet	1.95
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pulp	2.25
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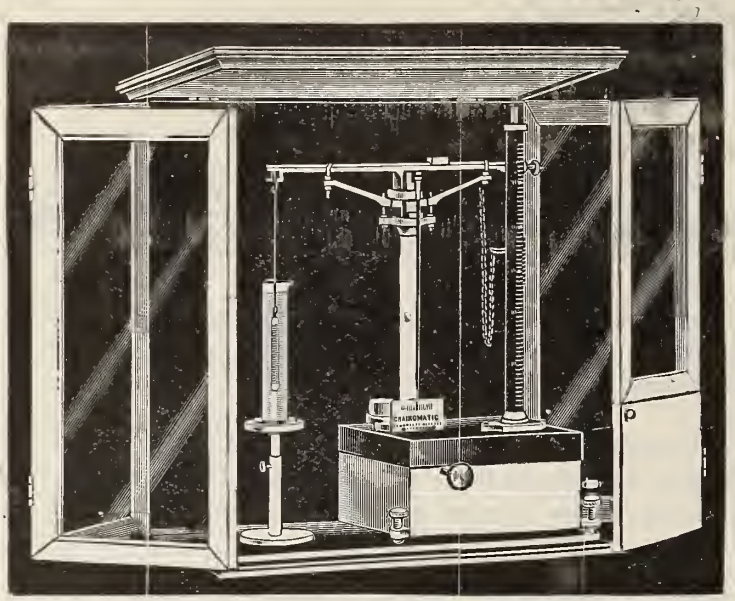

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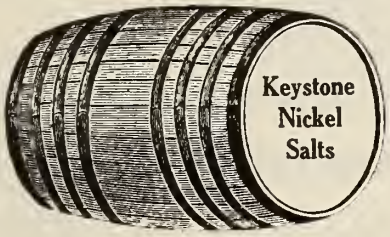

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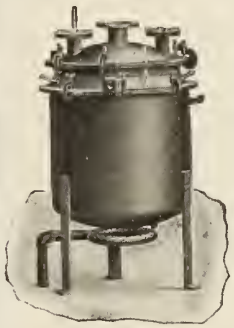

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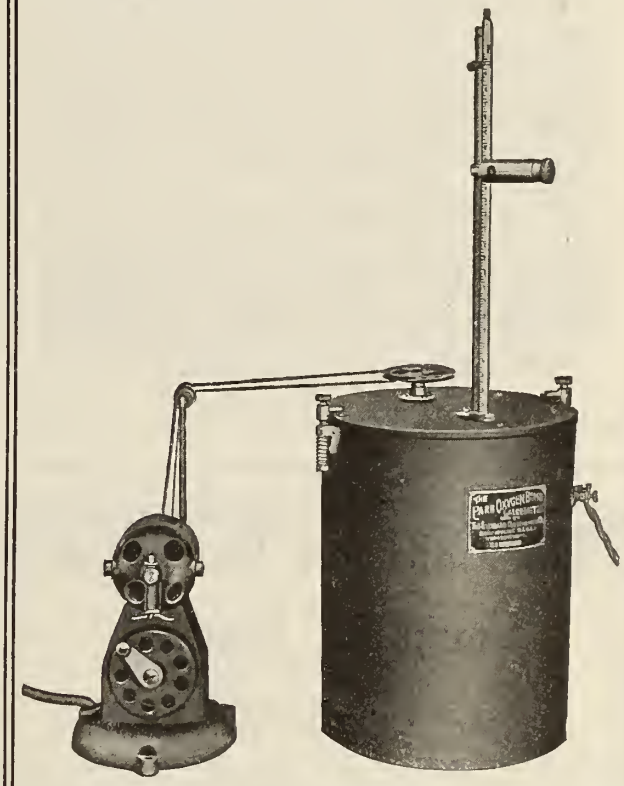

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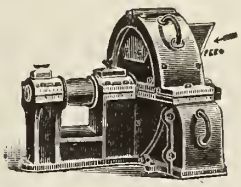

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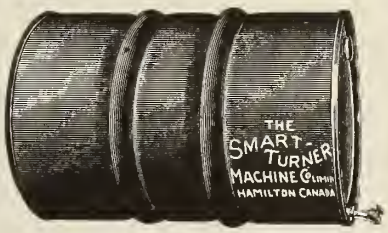

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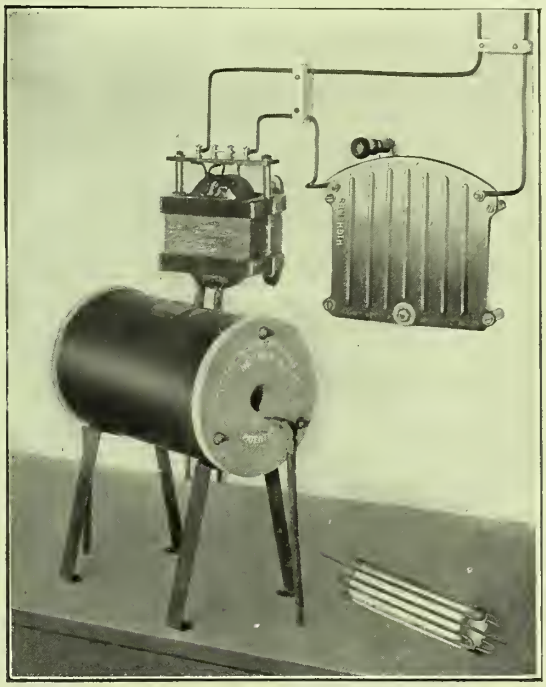

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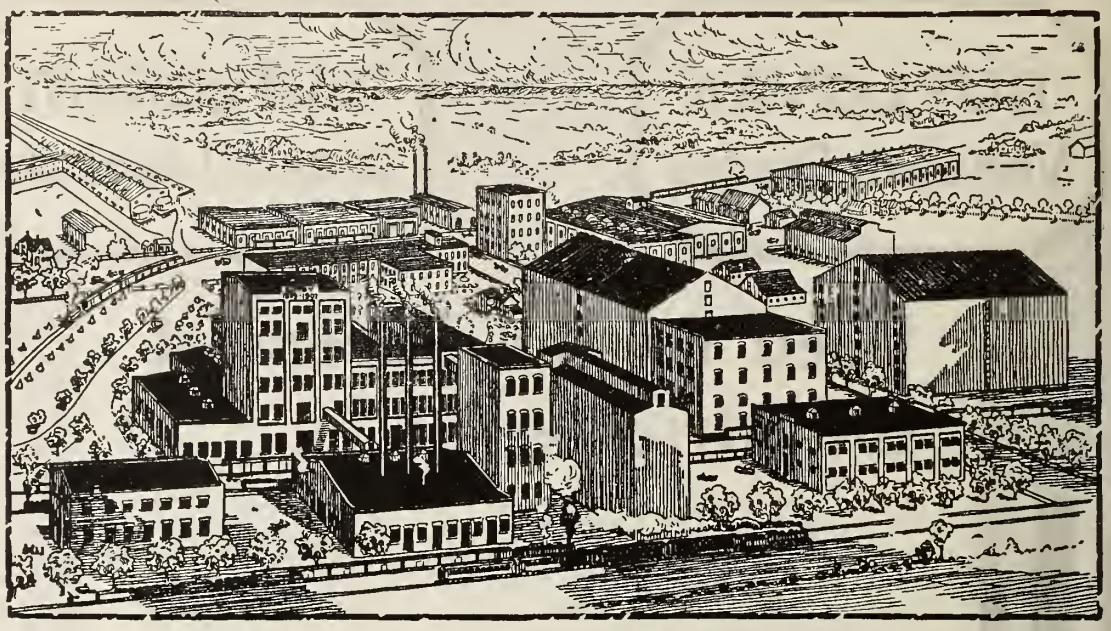

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ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF LANDS FORESTS & MINES
BUREAU OF MINES

Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Summary of Mineral Statistics, 1919.

Product.		Quantity. 1918.	Quantity. 1919.	Value. 1918.	Value. 1919.
Metallic:					
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, holow building		.....	.....	195,588	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,726
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc.		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	80,308,972	57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

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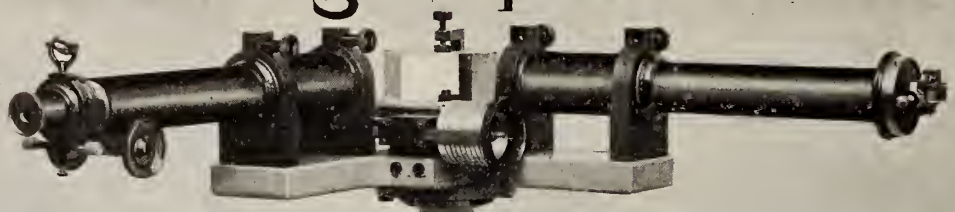

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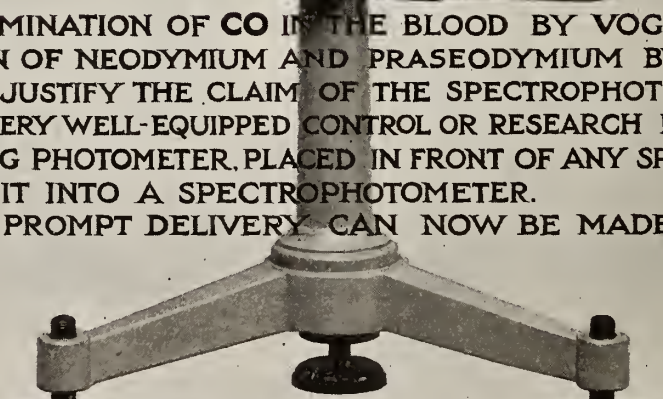

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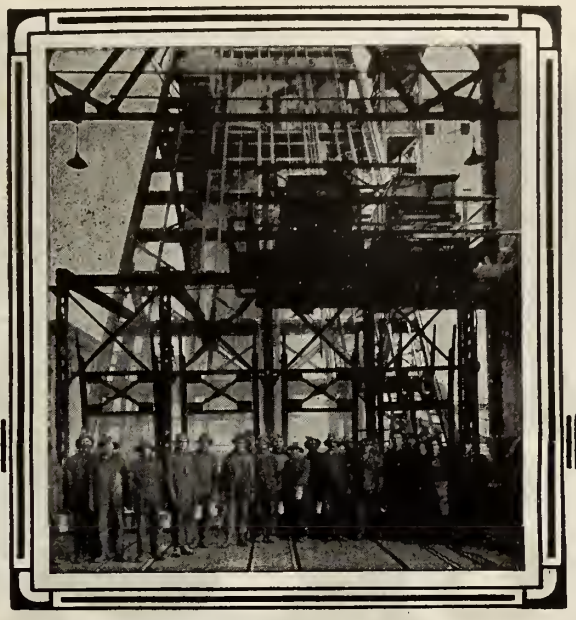

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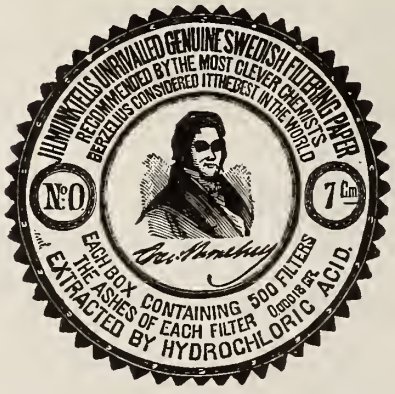
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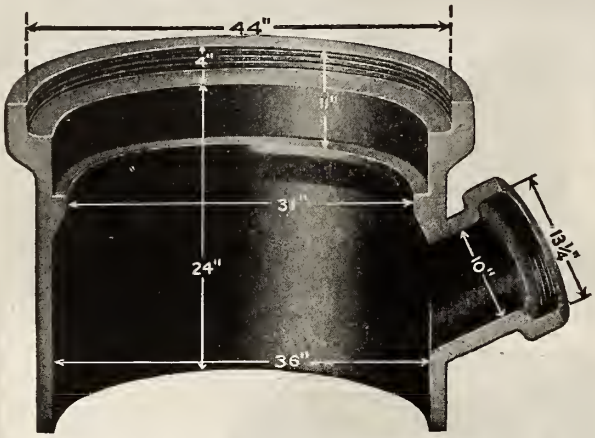

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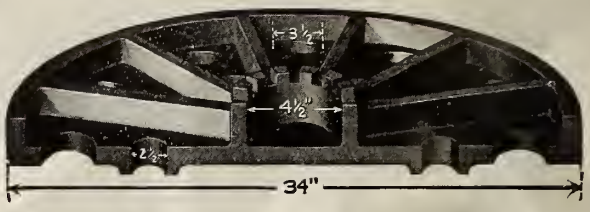

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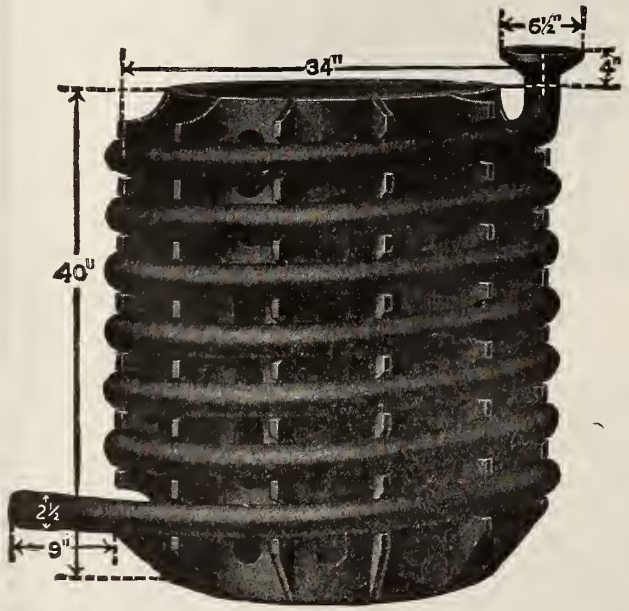

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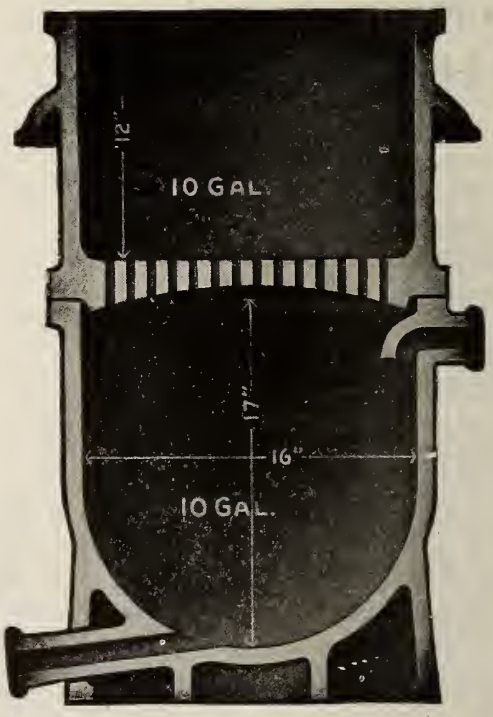

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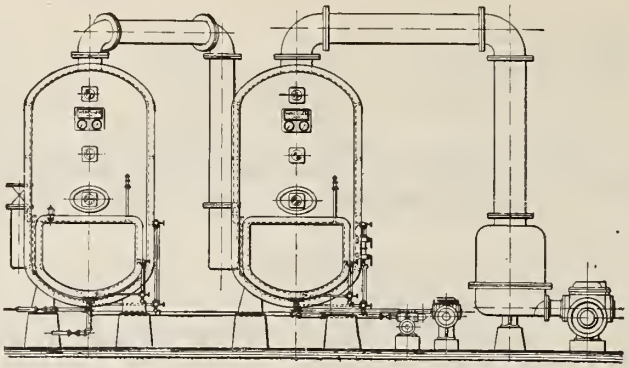

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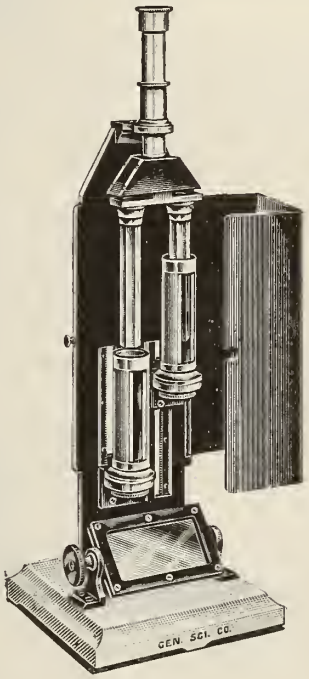

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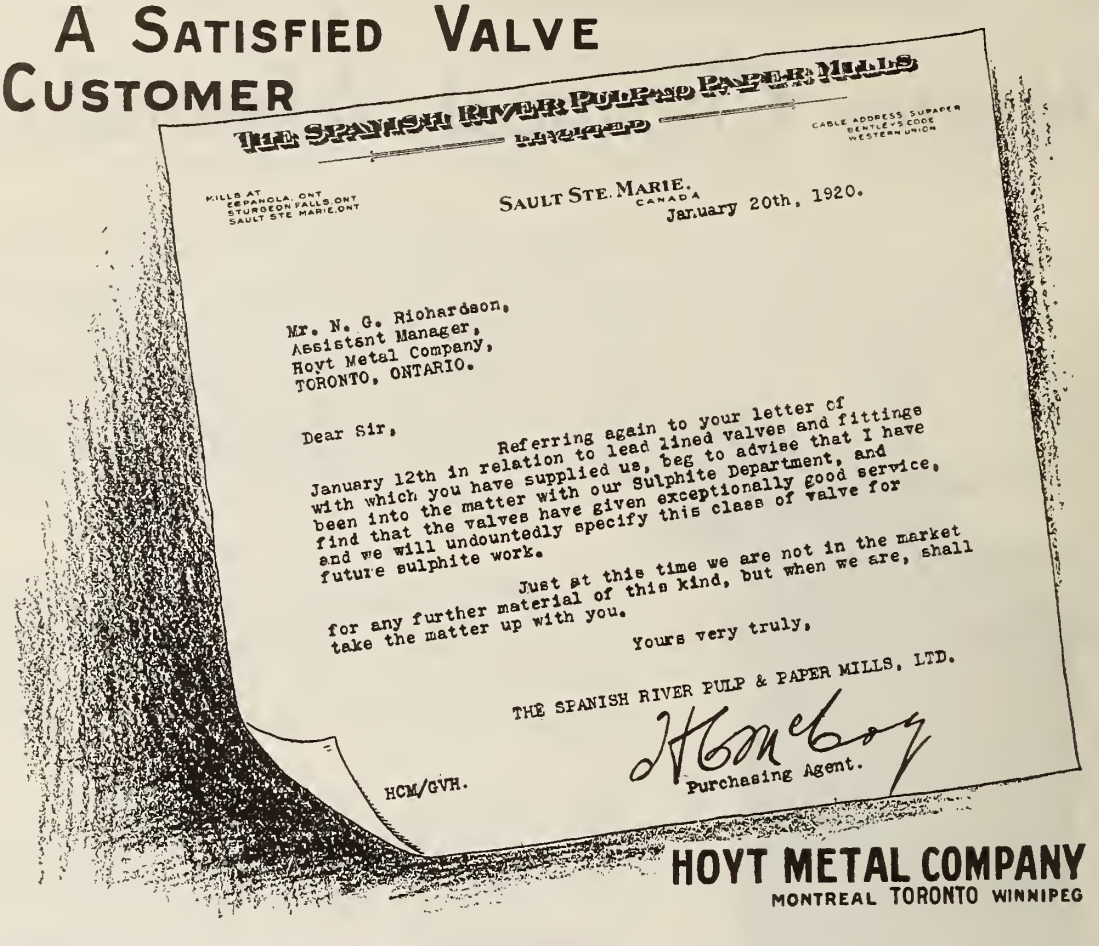

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CANADIAN CHEMICAL JOURNAL

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EDITORIALS

DR. HERTY'S MESSAGE.

UNDOUBTEDLY the most important feature of the recent Convention of Chemists at Toronto was the message which Canadian chemists received from Dr. Charles H. Herty. Choosing as his subject "Chemistry Under a Constitutional Government," a field was opened up which offered common problems for Anglo-Saxon races. His first-hand information, his keen sense of the trend of events and his great opportunity as a leader of American chemists, coupled with a personality of the type that makes for broad and kindly leadership, gave his words a lasting power with the Canadian chemists who were privileged to be present.

Like others, he too confessed that the true significance of the development of Germany under her former rulers was completely misinterpreted by him. The carefully chosen methods which exalted chemistry and the chemist in Germany and blinded the world were made possible only under a government directed by an autocratic group of individuals led by an unscrupulous ambition for world domination Thus the greatest conscious development of chemistry to date has been put to the most degraded purpose. Our duty as a group of peoples is to push forward an even greater development and to see to it that the applications of professional knowledge are directed towards the betterment of mankind and the full unfolding of a civilized progress, free from the terrors of destruction and war.

How are those who govern as representatives of the people to grasp and direct properly this means of protection and industrial advance? In general, they do not yet see eye to eye with the chemist; they do not fully understand and appreciate the significance of past events, and the absolute certainty of the importance of his work. Matters of supreme national importance in England, the United States and Canada are treated by politicians and Governments with no regard to their tremendous significance, because the people as a whole do not grasp the meaning of industrial developments of a chemical nature. The representatives of the people cannot be blamed entirely for our national slothfulness in technical matters. They represent the people who elected them, and the problem of the technical man and chemist is to educate the multitude to the end that their representatives will have the viewpoint and take the action that some autocratic leaders have taken on their own initiative.

What has been done in the United States by a few chemists who definitely started out to familiarize the American people with the significance of chemical industries and the necessity for more intelligent attention to these matters by Congress shows that the task is by no means hopeless. It has been found that the daily and weekly papers were glad to use instructive articles covering specific technical matters of general importance, if these were presented in the right way. A regular news service has been developed and has been maintained on an unsubsidized level, so that no opening might be given for criticism. The movement is gaining ground and the method is proving correct. It will take a long time, but eventually it is hoped that an impression will be made on the whole mass of the voting public which will be reflected in much closer attention being given to all questions involving the application of chemistry to industrial development and research. With this accomplished, it should be easy to obtain a large measure of support for scientific work and direct its objects along proper channels.

The whole question of the work, as outlined above by Dr. Herty, is one which should appeal both to the capitalist, the brain-worker and the manual laborer, because without question the progress of science, if directed to proper ends, can do more to solve the problems of this era than any makeshift effort. Science having revolutionized the world by its developments must now go on pressing forward towards a plane upon which individuals may rest in the full and unstinted expression of their noblest faculties, producing thus a method of living which will be as intelligently satisfactory to future generations as blind savagery was to our ancestors. Because there is no stopping now, there is the more need for directed effort.

As an inspiration to Canadians to begin at once to work out the future of Canadian industries and their developments along such basic methods of progress, nothing more or better could be desired, and it will be unfortunate indeed if the ideas expressed do not go far to initiate some similar united action on the part of Canadian chemists in particular and the professions in general.

RECENT ELECTRIC POWER STATISTICS.

THE Dominion Water Power Branch of the Department of the Interior, Ottawa, has recently made an analysis of the central electric station industry. With a pressing scarcity of power in some localities, with the coal situation not solved and labor difficulties retarding construction and mining, the

analysis given out by this Department is of some special interest. The statistics are of January 1, 1919, and cover only the generation and distribution of electrical energy in so far as such energy is not used directly by the station reporting. The survey was made from reports of 795 stations, of which 64.8 per cent generate their own power. Commercial stations now number 377 and municipal stations 418. Most of the municipal non-generating stations are in Ontario.

The aggregate capacity of all primary power machines is now 1,958,642 horse-power, of which 77.9 per cent was reported by commercial stations and 22.1 per cent by municipal stations. When the source of this power is considered, we find that the total may be divided for all prime movers as follows:—

From water, 1,682,191 horse-power; from steam, 262,562 horse power; and from gas and fuel oil, 13,889 horse power.

Looking at this power in its relation to our total population, some idea is gained as to our strong position among other countries as a developer of electric energy. For the Dominion, the average primary power installation of main plants amounts to 209 horse-power per thousand. To trace the dominating effect of water-power developments throughout the provinces, averages on above basis are given. The horse-power per thousand stands as follows for provinces:—Yukon, 1.135; British Columbia, 302; Ontario, 277; Quebec, 263; Alberta, 129; Manitoba, 121; New Brunswick, 50; Saskatchewan, 41; Nova Scotia, 38; Prince Edward Island, 14. A rather complete conception of how our power is distributed is obtained from the estimate that 72.7 per cent of all the developed water-power in the Dominion is used in the central electric station industry. Saskatchewan is the only province deriving 100 per cent of its central electric station energy from fuel, while less than 2.5 per cent is developed in this way in Quebec.

For the Dominion, the total invested amounts to $364,479,961, or $218 per installed turbine horse-power. When the amount invested in fuel power auxiliaries is taken out, and the capacity of the primary power machines of these plants added to the capacity of the hydraulic turbines, the capital investment per installed primary horse-power for the hydro stations amounts to $203.

There is evidence of a decided activity in the development of electrical energy for central electric station purposes. All factors are working to this end. Our industries and transportation systems demand the utilization to the full of what might be called home energy. There are very good reasons for the feverish haste shown by those struggling for new developments and the extension and completion of construction work under way. Although a Dominion increase of over 130,000 horse-power is reported to be immediately available, it does not seem probable that our construction is likely to keep ahead of the demand for some time to come.

CHEMISTRY AT THE NEXT CANADIAN NATIONAL EXHIBITION.

THERE is a well-aroused feeling among chemists that they have a place in our national development which they should occupy more completely than they do at all times. When you get away down to fundamentals in manufacturing, having long since left the political methods of progress, you note generally that the whole system depends upon the application and development of the skill of some technical man. As one of these discoverers, it is about time that the chemist began to be known broadly.

Secrecy is going. There is no doubt about that. It must be really amazing to some of the practical men connected with our industries who never read their subject and who have grown up in the old way with their job, to note what a remarkable knowledge some of the younger university men have even when they first come to the plant. Some one is certainly giving the game away. Let us begin to talk sanely about our business, and let the crowd know our place in the everyday world.

The Society of Chemical Industry in Canada is a force working most unselfishly for the benefit and development of all our home industries. At a meeting of the Toronto branch last winter, it was decided that the time had come when the public generally might well begin to receive its first lesson in industrial chemistry. No better opportunity is offered in Canada than the Canadian National Exhibition, and a committee representing the Society, after considerable work, has been able to secure space for the first Industrial Chemical Section ever placed at the National Exhibition.

This is something that is right in line with the best ideals of progress for the profession and should be utilized to the fullest extent by those companies whose products are chemicals or whose processes have a chemical angle in which the public undoubtedly would be interested. We have yet to meet the person whose imagination and interest were not caught and held by the explanation of manufacturing processes in simple chemical language. If these be illustrated or demonstrated, the opportunity is enlarged.

This is a real business opportunity for many companies, and at the present time is practically assured

for this year. From the personal viewpoint, it should be taken by the chemist as an indication that the field of his opportunities is broader than he ever dared to dream, always provided that he is the right kind of chemist.

ALUMINUM AND BAUXITE.

Aluminum in Norway.

Norway has not previously been a producer of aluminum, having been wholly dependent upon imports, but during the war The Hoyangfaldene Co., was formed to undertake domestic production. Jetland Falls, from which the Hoyanger plant obtains its power, furnish an available 80,000 H.P., of which 30,000 H.P. has been utilized at a cost of 6,708,207 kroner ($1,811,211.90 at the normal exchange rate). It is estimated that the total development cost for the whole plant installed will be 300 to 350 kroner ($80 to $95) per H.P. The whole enterprise includes works which will produce 7,000 tons of metallic aluminum, 5,000 tons of electrodes and 12,000 tons of carbide, in addition to workmen's houses, warehouses, wharfs, and so on.

No sources of bauxite are known in Norway, but the company is affiliated with the Societe des Alumines and Bauxite de Provence, of France, which owns adequate sources of bauxite. Since the close of the war the French Government has consented to allow the importation of machinery from the United States to complete the alumina works in France, and it is expected that production of aluminia will begin very shortly. In the meantime the Hoyangfaldene Co. has been manufacturing electrodes, carbide, and iron and has been experimenting on a large scale with domestic raw materials to discover a local source of aluminum, and it is reported that they have obtained very encouraging results. In this connection it is of interest to note that the development of a process of extracting aluminum from labradorite has recently been reported from Norway. The process involves the solution of labradorite in dilute nitric acid made locally, leaving the impurities as a residue; evaporation and heating to a point at which the aluminum nitrate alone is decomposed, and the dissolving of the calcium and sodium nitrates in water, leaving pure aluminum oxide. Labradorite, as ordinarily found in this country is not sufficiently soluble in nitric acid to make this process seem feasible on a commercial basis; but it is possible that the Norwegian material is not a true labradorite and is much more soluble. Pure labradorite contains about 30 per cent. alumnia, or 16 per cent. metallic aluminum.

The Norske Aluminum Co., almost wholly controlled by the Hoyangfaldene Co., has been formed and has acquired the necessary plant to manufacture aluminum ware from metallic aluminum. It is expected that the French, and both Norwegian plants, will be in operation during this year.

Aluminum and Bauxite—Italy.

It is reported that the Italian Government is arranging to purchase the large Abruzzi and Tamnium bauxite deposits, to be worked by the Government. The probable intention is to manufacture aluminum wire to be used in place of copper in the electrification of the Italian railways. Italy's resources of bauxite are sufficiently large to permit production on a large scale.—U. S. Bureau of Mines, Reports of Investigation, by R. B. Lados.

CANADIAN MEETING OF AMERICAN INSTITUTE OF CHEMICAL ENGINEERS.

From June 28 to July 5 the American Institute of Chemical Engineers have arranged to hold their twelfth semi-annual meeting in Montreal, and visit afterwards some important chemical and metallurgical plants in Ontario and Quebec. A special train from Montreal has been arranged for.

The following papers will be presented during Monday and Tuesday, June 28 and 29 at the Hotel Windsor, Montreal:—

Early Commercial Electrolytic Cells.....C. B. Barton
The Vertical Cylindrical Cell.....L. D. Vorce
Other papers on Electrolytic Cells will be presented by.....Hugh K. Moore, Herbert Dow, A. H. Hooker
Utilization of Peat.....B. F. Haanel
Chemistry of Rubber.....Maximilian Toch
The Evaporator Laboratory at the University of Michigan.....W. L. Badger
The Relation Between Temperature Drop and Heat Transmission in Vertical Tube Evaporators.....W. L. Badger and P. W. Shepard
The Relation Between the Boiling Point of Saturated Sodium Chloride Solution and Pressure.....W. L. Badger and E. M. Baker
The Relation Between Hydrostatic Head and Temperature Drop in Vertical Tube Evaporators.....W. L. Badger and P. W. Shepard
The Manufacture of Lime for Chemical and Metallurgical Purposes.....R. K. Meade
Production of Monochlor Benzol and Nitrated Products from It.....E. H. French
The Mann Report.....A. W. Smith
Experiments on the Corrosion of Iron and Steel.....W. D. Richardson
The Solution of Metals in Acids as Related to Corrosion.....W. D. Richardson
A Suggested Basis for an Index of Corrosion of Iron and Steel .....W. D. Richardson
Industrial Applications of Absorption.....E. B. Miller (Illustrated by Lantern Slides)
The Proposed National Department of Public Works.....James R. Withrow
Sulphuric Acid Plant Fume Problem.....James R. Withrow and Frank C. Vilbrandt

Leaving Montreal Tuesday night, the programme is as follows:—

Wednesday, June 30—Ottawa.
Visits to the laboratories of the Bureau of Mines and Parliament Buildings.

Thursday, July 1st—Belleville, Ontario.
Motor drive about city visiting points of interest.
Motor trip to Deloro, via Sterling, Marmora, viewing enroute the Oak Hills and the Trent Valley.
Complimentary Luncheon at Deloro.
Inspection of plant of Deloro Smelting & Refining Co., Ltd., inspecting process of smelting and refining Silver, Cobalt and Nickel ores from the Cobalt Mining region, and the recovery of the by-products of Arsenic, Copper, etc. Stellite metal is also produced.
Return trip via Madoc, where Fluorspar Mines and the milling plant of G. H. Gillespie & Co., miners and manufacturers of Talc will be visited.
Inspection of the extensive works of the Industrial Alcohol Co., Ltd., at Corbyville.
Informal reception of members and ladies at the Belleville Club.
Complimentary Dinner at the Hotel Quinte tendered by the City of Belleville and County of Hastings.
Ladies will be entertained by motor drives along the Kingston Road on the shore of the Bay of Quinte. Luncheon at the Belleville Golf Club House and motor drive over the Oak Hills to Sterling, along the Trent River to Frankfort and Trenton and return to Belleville over the Provincial Trunk Highway.

Friday, July 2nd—Shawinigan Falls.
Visits to Power House of the Shawinigan Water & Power Co.
Plant of the Belgo Canadian Pulp & Paper Co., manufacturers of paper, ground wood, sulphite, etc.
Plant of the Canada Carbide Co., manufacturing Calcium Carbide.
Plant of the Canadian Electro Products Co., manufacturers of Acetaldehyde, Paraldehyde and Acetic Acid.
Entertainment for the ladies.
Opportunity may be afforded for those who desire to stop at Grand Mere and visit the Laurentide Pulp and Paper Mill.

Saturday, July 3rd—LaTuque.
Visit to sulphate pulp mill of Brown Company.
Fishing and boating at Wayagamac Club.

Sunday, July 4th—Chicoutimi.
All-day steamer trip down the Sagenay River to Quebec. The Sagenay trip is one of the famous trips of the world and affords a view of the beautiful scenery on this river and also on the Lower St. Lawrence.

Monday, July 5th.
Visiting the beautiful and historic city of Quebec.

Convention of Canadian Chemists

Report of Proceedings of Third Annual Meeting, Held at Toronto, May 27th and 28th, 1920

The third annual meeting of the Chemists of Canada has come and gone, and can now be recorded as having been one of the most successful events in the history of Chemistry in Canada. The large number that attended the Convention (over 200), the beautiful May weather, and the prevailing spirit of enthusiasm and good fellowship were features that crowned the gathering with that success which the untiring efforts of the committee in charge and those who assisted them so justly warranted.

The University of Toronto, which opened almost every door to the visiting chemists, proved an ideal centre for convention activities. The meetings in the Mining Building and at Hart House, the noon luncheons at Victoria College, and, finally, the annual dinner in the beautiful great hall of Hart House, will ever leave pleasant memories in the minds of all those who attended.

The whole Dominion was represented, as a glance at the list of registrations at the conclusion of this report will show. It was truly an inspiration to the younger chemists to see so many men, prominent in their profession or industry, present.

The co-operation between the chemical and laboratory equipment manufacturer and the chemist was plainly in evidence. The industrial exhibits in the main hall of the Mining Building were a feature of the convention that proved exceedingly interesting, and one that is bound to grow from year to year. Considering that this was only the second time in Canada that such an exhibit was ever held, the showing was very good indeed.

Thursday, May 27th.

Dr. W. L. Goodwin, of Queen's University, Kingston, chairman (session 1919-20) of the Canadian section, Society of Chemical Industry, presided at the opening meeting of the convention on Thursday. This session was devoted to the reading of papers by three well-known members of the Canadian Institute of Chemistry, H. J. Roast, G. H. Tomlinson and S. J. Cook.

The first paper, "The Inner Life and Habits of Metals," that by Mr. Roast, was of special interest to the metallurgists. This paper was prepared by Mr. Roast and Mr. C. F. Pascoe, who have for some time interested themselves in the production and collection of various ferrous and non-ferrous metals and alloys, and had made studies of these under the microscope. The paper was illustrated by lantern slides, and proved most interesting. The chief point brought out by Messrs. Roast and Pascoe was that several diseased conditions such as exist in the human body, can be compared to similar conditions found under the microscope in metals.

The increasing industrial importance of the process for producing liquid carbon dioxide from combustion gases was brought out in the paper of Mr. Geo. Tomlinson on "The Bicarbonate Reaction and its Application to the Manufacture of Carbon Dioxide." The theoretical considerations involved in the reaction of the alkaline bicarbonates were discussed and practical examples illustrating the theory given. This excellent paper, as well as all the other papers given at the convention, will be published in this journal commencing with the July issue.

The opportunities offered to chemists and those desirous of developing the natural resources of the Dominion through the application of chemistry to industry were well portrayed by Mr. S. J. Cook, of the Chemistry and Mining Division, Bureau of Statistics, Ottawa. Mr. Cook takes a wide view of the opportunities awaiting progressive men in Canada, and his paper reflected his thorough knowledge of the subject.

A paper on "Decolorizing Blacks," by C. F. Bardorf, was presented but not read.

Meeting of Canadian Section, Society of Chemical Industry.

Following luncheon in the dining-hall of Victoria College, the afternoon meeting opened in the lecture hall of Hart House, with Dr. W. L. Goodwin presiding. The first part of the meeting was devoted to the reading of the annual report of the Hon. Secretary of the Canadian Section of the Society of Chemical Industry, Mr. Alfred Burton. In his report, Mr. Burton emphasized the good progress that had been made during the year by the Canadian Section, which would now disappear, as far as name was concerned, and the several branches of the section would be constituted as sections. In the meantime, however, until such dissolution of the Canadian Section as a section was made, it would be necessary to still maintain the usual Executive or Overhead Committee, and the following will comprise this committee: Chairman, Dr. H. van der Linde; Hon. Secretary, Alfred Burton, 114 Bedford Road, Toronto; Dr. W. L. Goodwin, Dr. R. F. Ruttan, Dr. W. Lash Miller, Dr. W. L. Lang, Dr. F. T. Shutt, M. L. Davies, C. R. Hazen, M. L. Hersey, H. J. Roast, L. J. Rogers, H. M. Lancaster, A. F. MacLean.

Dr. Goodwin then introduced the speaker of the convention, Dr. Charles H. Herty, editor of "The Journal of Industrial and Engineering Chemistry," and past-president of the American Chemical Society. Those who heard Dr. Herty will not soon forget the message he brought to the chemists of Canada. It was a message of optimism, of hope for the future, replete with splendid advice and suggestions as to the best means of promoting the interests of the chemists and chemical industry, and of giving the general public that knowledge and appreciation of chemistry which is so badly needed before chemists can really come into their own.

In his opening remarks, Dr. Herty said that he had come to Toronto first of all because he was a firm believer in "folks getting together," and secondly, because he wished to find out what problems were facing the Canadian chemist. He believed that the chief problem of Canadian chemists was similar to that of chemists in the United States and Great Britain. It was a deeper question than merely the pay or wage question. Should war ever come to the world again, the chemists were the men who would have to stand behind the guns. It therefore became a patriotic duty for the Anglo-Saxon race to excel in chemistry and its application. It was a duty that race owed to the whole world, for undoubtedly the peace of the world would lie ultimately with that race, and the degree of preparedness it could show in order to keep power-grasping nations in their proper places.

Dr. Herty then compared the progress chemistry had made under the constitutional or democratic governments, such as those of Great Britain and the United States, and that autocratic form, such as prevailed in Germany. In

1900 he (the speaker) had been studying in Germany, and had been entirely misled by the program of the Kaiser in the matter of industrial development. While at that time the German Government appeared to be fostering the development of her industries, at the same time this industrial development went hand in hand with great military development. The German dye industry was pushed ahead with a full cognizance of its relation to the manufacturing of explosives for war purposes. Technical schools were encouraged by the Kaiser, and the technical man was placed on a pedestal upon which other classes, though many of them were receiving more pay, gazed in awe. The German technical man was admired, praised and even worshipped, by other professions, which went far to calm any demands for adequate pay. It was not necessary to obtain, under this autocratic form of government, the consent of representatives of the people in order to pass any legislation that would promote chemical industry or produce many technical men. The Kaiser would simply say, "Let there be a technical school here and another there," and the thing was done. Thus chemistry and industrial development was made to flourish under the autocratic government of Germany.

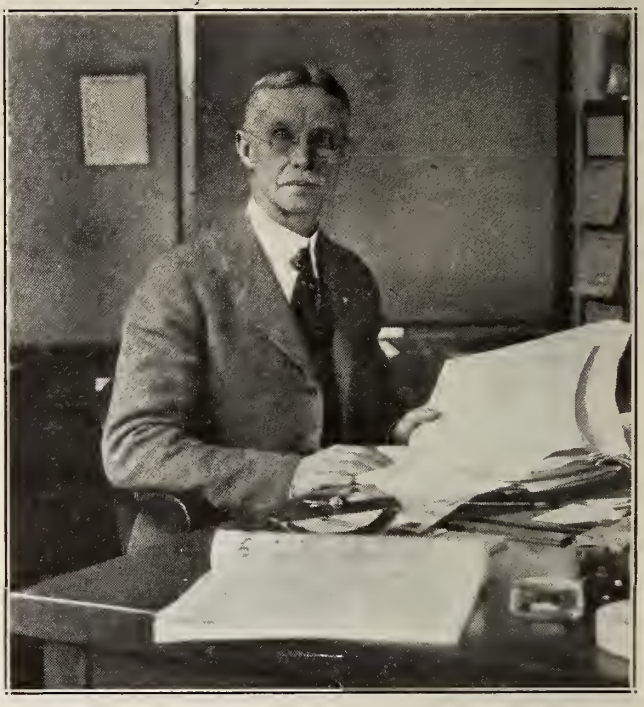
But it was an entirely different matter with the United States, Canada, or Great Britain. All present would appreciate the difficulty experienced in getting matters relating to scientific development accomplished in our legislatures. And why? Because, after all, our representatives in parliament reflect the views of the mass of the people and they in turn do not appreciate the situation as the chemist sees it. It therefore follows that to get scientific development along chemical lines accomplished by our democratic governments, we must let the people know what chemistry is, in order that the representatives of the people who go to the legislatures and make the laws, may know what chemistry is and how to appreciate its application to the industrial development of the country.

It was, therefore, the duty of every chemist to acquaint the people with chemistry. Some chemists seemed to have the idea that it was beneath their dignity to let the people know anything about chemistry. How then could the people or our legislators ever appreciate it? The chemist must take the people into his confidence, and he was glad to announce that the American chemists were doing this. The only way to accomplish it was by publicity, by letting the people know through their daily and weekly city and town papers what chemistry is and its applications. This would educate the people as to the value of chemistry to the nation. Dr. Herty then told how the American Chemical Society had tackled the problem, how their publicity committee had increased the number of newspaper references to the Buffalo Convention of Chemists, last year, from 65, when the committee was first organized, to 1,114 references to the St. Louis Convention of this year.

The main opposition to the formation of a dye industry in the United States and the passing of the Dye Bill, now before Washington, was from a United States firm, controlled by German capital, said Dr. Herty. "When I think of what they (the Germans) are doing right to-day, under the guise of peace and industrial restoration," said Dr. Herty, "it makes me feel that it is time our people knew these things, and that the chemist should be recognized as the strongest right-hand man of his country. Is the German of to-day any different from that of five years ago? We have absolutely no reason to believe that he is, and until the German changes his heart, superior force is the only language in which you can talk to him, and such a force cannot be obtained without the fullest application of chemistry." Dr. Herty, in closing, said that such a superior force on the part of the Anglo-Saxon race would not be used or thought of for selfish, commercial or any other use, other than as a safeguard to the treaties of the world, to the small nations, and as a blessing to the whole human race.

At the conclusion of Dr. Herty's address, Dr. Goodwin remarked that if some practical result did not follow from Dr. Herty's address it would not be because of lack of inspiration. He would pass on to Dr. Herty the kind appreciation of the Canadian chemists for his having come to the convention to address them.

Dr. Herty's address was received with an expression of feeling and regard seldom accorded any speaker.



DR. CHARLES HERTY.

Following Dr. Herty's address the meeting adjourned to the Mining Building for the hearing of two more papers, that on "The History of the Varnish Industry," by Mr. Norman Holland, president of the Holland Varnish Company, Ltd., and by Dr. J. Waddell, of Queen's University, on "Capital and Labor; and Chemists." Mr. Holland traced the development of the varnish industry, his paper being illustrated by slides collected over a period of twenty years, showing the methods used in the collecting of the crude gums and China wood oil.

Capital and Labor; and Chemists.

The exellent paper of Dr. Waddell was followed with the closest attention and interest. He emphasized the need of chemists giving more attention to what were often termed "side lines," such as economics. There was too great a tendency for university men to so specialize in their courses that they know practically nothing about the great problems that were facing the world, and that would face them when they entered the industrial world. He questioned whether it was wise for chemists to join in the prevailing mad race for the highest possible wage for the least possible work. What the world needed was for everyone to work a little harder than ever before. Chemists had far too low an estimate of the value of such studies as economics and labor problems, and before they could

Group of chemists attending Toronto Convention, 1920, including many well-known university and industrial men.
Left to Right—First Row: Prof. L. J. Rogers, Dr. Lash Miller, Dr. W. L. Goodwin, Dr. R. F. Ruttan, Dr. W. H. Ellis, Dr. Chas. Herty, Dr. H. van der Linde, T. H. Wardleworth.
Middle Row: Dr. H. Bigelow, Prof. J. T. Burt-Gerrans, L. E. Westman, Prof. Lehman, F. C. Collier, Dr. F. T. Shutt, Prof. G. A. Evans, G. D. McIntyre, Dr. L. F. Goodwin, H. J. Roast, J. B. Bell, Dr. MacLean.
Back Row: F. J. Hambly, H. M. Lancaster, W. H. Thom, C. F. Thurlow, Alfred Burton, L. T. Acton, Prof. E. G. R. Ardagh, Prof. J. W. Bain, S. J. Cook.

ever take their proper place either in their own development, or the nation's, they should acquaint themselves with these important matters.

National Industrial Conference.

The following report was then read by Mr. T. L. Crossley:

To the Society of Chemical Industry:

Report of sub-Committee re National Industrial Conference:

Your Sub-Committee has given careful consideration to the report of the Society's representative to the National Industrial Conference at Ottawa Sept. 15-20, 1919.

We recommend the following action:

(a) That we endorse the resolutions that were passed by the conference, and urge action by the Federal and Provincial Governments along the lines indicated and that we inform the Minister of Labor to that effect.

(b) That we communicate to the Minister of Labor the following statement of our views in connection with the three items upon which no agreement was reached.

1. Re Hours of Labor.
   We are of the opinion that in the industries chiefly dependent upon chemical processes and reactions, the hours of labor must be regulated by special demands of such work, and therefore we cannot endorse any legislative prescription of the eight-hour day.
2. The Right to Organize, Recognition of Unions, and Collective Bargaining.
   We are of the opinion that employers should be required to deal only with their own employees in issues concerning their mutual or respective interests, except as provided in the "Industrial Disputes Prevention Act."
3. Re Government Employees.
   We do not feel that we can properly take action in this case, except wherein we might be asked to advise in connection with chemists or chemical engineers in such employ.

ance that they welcomed the establishment in Canada of an

(c) We endorse the recommendation of our representative, which follows, as amended after discussion:

1. That if such conferences take place again, technical interests be more largely represented.
2. That our Society or some other chemist body be asked to send at least two members.
3. That in future conferences the third group should be more nearly neutral in personnel, so that action might be taken as a body.
4. That educational interest be represented.
5. That organizations such as ours advise the Minister of Labor that we would be glad to assist as third parties or members of boards or commissions to carry out the resolutions of the conference.

Respectfully submitted,

A. NIEGHORN. T. L. CROSSLEY.
D. E. BEYNON, L. E. WESTMAN,

A copy of the above report will be sent to the Minister of Labor, Ottawa, by resolution of the convention.

Friday, May 28th.—Canadian Institute of Chemistry.

At 9.30 Friday morning the annual meeting of the Canadian Institute of Chemistry was held in the Mining Building. Professor J. Watson Bain, president, was chairman, and the chief business was the reading of the annual report by the secretary, Mr. H. J. Roast, and the consideration of the newly-formed by-laws of the Institute, which were read clause by clause for approval. In his report, Mr. Roast announced that Prof. Matthew A. Parker, Winnipeg, a

member of Council and a Fellow of the Institute, would represent Canada, through the intervention of the Institute, at the meeting of the Inter-Allied Chemical Union in Rome this month. Letters had been sent introducing the Institute to the various other chemical organizations in the United States and in England, to which cordial and courteous replies had been received, coupled with the assurrance that they welcomed the establishment in Canada of an Institute whose aim was to raise the status of the chemist. General correspondence had been carried on, particularly in connection with the applications for membership, a little over 3,600 letters having been sent out from the office of the Institute. An Employment Bureau had been started, and through it several chemists had been assisted in getting positions, and one or two companies in getting chemists. The total membership to date was 147, of which number 142 were Fellows. Two applications had been rejected as not coming up to the standard of the Institute.

The financial statement of the Institute as presented by Mr. Roast was as follows:—

Financial Statement year ended April 30th, 1920:

INCOME.

Subscriptions	$ 500.00	
Initiation Fees	1,215.00	
Annual Dues	1,255.00	
		$2,970.00

EXPENDITURE.

Salaries	$551.00	
Travelling Expense	14.00	
Rent and Taxes	354.30	
Printing	243.40	
Stationery and Office Supplies	28.55	
Telephone	63.38	
Lettering Door	7.00	
Special Translation	15.00	
Laundry	3.00	
Exchange	2.22	
Petty Cash	154.18	
Contribution to Chemistry Organization	60.00	
Contribution to Union Internationale	88.50	
		1,584.53
		$1,385.47

SURPLUS.
Composed of

Office Furniture and Equipment	$ 261.49	
Cash on Hand and in Bank	1,158.98	
	$1,420.47	
Less Fees and Dues Held in Abeyance on Account of Non-election of Members	35.00	
		$1,385.47

Audited and certified correct:
P. S. ROSS & SONS.
Chartered Accountants.
Montreal, May 12th, 1920.

Moved by Dr. Ruttan, seconded by Dr. L. F. Goodwin, that the annual report be accepted and that the thanks of the Institute be tendered Mr. Roast for his good work on behalf of the Institute. Carried.

The by-laws as amended will be published in this Journal in an early issue.

Fees—The question of fees occupied considerable time. It was moved by S. J. Cook, seconded by Dr. F. T. Shutt, that the entrance fee for Fellows be $14 and the annual fee $6; and that the entrance fee for Associates be $7, and the annual fee $3.00.

Moved in amendment by Dr. L. F. Goodwin, seconded by Dr. A. Neish, that the entrance fee for Fellows be $10 and the annual fee $10; and that the entrance fee for Associates be $5 and the annual fee $5, with free receipt to members of the "Canadian Chemical Journal," the official Journal of the Institute. Amendment carried.

Excise Free Pure Ethyl Alcohol.

A motion by Dr. R. F. Ruttan, seconded by Mr. Tomlinson, urging the Dominion Government, by resolution. to grant the sale of pure ethyl alcohol for hospital, laboratory and industrial plant purposes, excise free, was unanimously carried.

Dr. Ruttan spoke strongly in favor of the resolution. He declared it a shame that hospitals should have to pay eight to eleven dollars a gallon for pure alcohol that should sell for ninety cents. Hospitals were forced to use methyl alcohol, and he personally knew of many instances where serious injury had been caused by the use of methyl alcohol where the pure alcohol was called for.

Visits to Industrial Plants.

Friday afternoon, following luncheon at Victoria College, motor trips were taken to various industrial plants in the city, providing a most interesting and instructive feature. The members were divided into four parties, and, in automobiles provided by Toronto members and friends, motored to the places to be inspected. The City Waterworks System, chlorination and filtration plants; Gutta Percha Rubber Company, Ltd., Harris Abattoir, Ltd., United Drug Co., Ltd., Lever Bros. Soap Works, Connaught Anti-toxin Laboratories, and the Eastman Kodak Co. were all visited. and most cordial receptions given the visiting chemists at each place. The trip through Lever Bros.' Soap Works and the plant of the United Drug Co. proved exceptionally interesting.

The Annual Dinner.

The annual dinner, held in the great hall at Hart House, and which brought the convention proceedings to a close, was an affair long to be remembered. Seldom indeed had such a distinguished group of chemists appeared together as those seated at the head table—Dr. W. H. Ellis, Dr. W. L. Goodwin, Dr. F. T. Shutt, Dr. Neish, Dr. H. van der Linde, Dr. J. Waddell, Mr. T. H. Wardleworth, Mr. David Gilmour, all occupying seats there.

Dr. W. L. Goodwin opened the proceedings by calling for the toast to the King, which was followed by another to H.R.H. the Prince of Wales, F.C.I.C.

Dr. Goodwin declared Dr H. van der Linde elected as Chairman of the Canadian Section of the Society of Chemical Industry, an announcement that was received with great applause. Dr. Goodwin referred to Dr. van der Linde's splendid and faithful efforts on behalf of the Canadian Section, to which Dr. van der Linde replied very feelingly.

Dr. F. T. Shutt, as the first speaker of the evening, stated that it had been a great pleasure for him to have lived to see the formation of a Canadian Institute of Chemistry. He believed that the Institute and the Society of Chemical Industry each had its own work to do. In the matter of publicity, as suggested by Dr. Herty, he thought there was a great work, in this connection, for Canadian chemists. and something that most certainly should be done.

At this point, Dr. van der Linde announced that as a tribute to Mr. Alfred Burton's long, faithful and excellent services as Honorary Secretary of the Canadian Section of the Society of Chemical Industry, he had been elected a Life member of the Society. Mr. Burton, being called on, was received with most hearty applause. He had, he said, simply done his duty. While he regretted seeing the Canadian Section passing out of existence as a section, it was, he felt assured, a tree from which powerful off-shoots would grow.

Mr. T. H. Wardleworth expressed the appreciation of the Montreal chemists for the way in which the Toronto men had arranged for the visitors' welfare while in the city. He predicted a bright future for the Canadian Institute of Chemistry and also for chemical industry in Canada.

Dr. A. Neish urged Canadians to take greater advantage of their opportunities. There was no reason why, if the best talent was secured, Canada could not branch out into the making of many chemicals and appliances at present secured elsewhere. The word "chemist," he thought, was much abused, and he favored the passing by Parliament of

a law compelling the removal of the word "chemist" from every drug store in the Dominion and leaving the words "druggist" and "pharmacist" exclusively for the druggists, as that was what they really were.

Dean W. H. Ellis, the most venerable figure in chemistry in Canada, paid tribute to the Massey family for having built and donated such a beautiful structure as Hart House. The college, city and country owed the Massey family an immense debt of gratitude for such a donation. Just as the gathering was about to disperse, Professor J. Watson Bain called on Dr. Lash Miller to speak, referring to Dr. Miller as "the one man who had done more than any other to make the convention a success." Dr. Miller reluctantly appeared and expressed his appreciation to the visiting chemists for attending in such large numbers. He was certain that the success of future conventions was assured.

"God Save the King" brought the evening to an end, and the third Annual Convention of Canadian Chemists to a most successful conclusion.

Mention should be made of the Veterans' Orchestra (composed all of returned soldiers), who supplied splendid instrumental and vocal selections throughout the evening.

The Industrial Exhibits.

The exhibits of chemicals, laboratory and plant equipment in the main hall of the Mining Building were viewed by many with great interest. The number of firms showing was decidedly a large increase on those appearing at the first exhibit held at last year's convention, and no doubt next year will see the number substantially increased.

The Arkell Safety Bag Co., showed their elastic paper linings for bags and barrels containing chemicals; the Bristol Instrument Co., through their Toronto representatives, A. H. Winter Joyner, Ltd., had on display a full line of the Bristol Recording Instruments, gauges, etc., adaptable to many uses in chemical and metallurgical plants; Canadian Laboratory Supplies', Ltd., Toronto, display thoroughly covered the field of laboratory equipment with neatly arranged tiers of instruments and apparatus from thermometers to electric ovens; the exhibit of pure natural magnesium sulphate (B.P. and technical) of the Ontario Oil and Turpentine Co., secured from the Basque Co.'s deposits at Basque, B.C., attracted particular attention, the samples being examined by everyone who had heard so much about these wonderful deposits. The large natural blocks of the salt built as pyramids formed a beautiful display. J. P. Devine Co., Buffalo, had a complete assortment of their catalogues and descriptive literature, describing their well-known lines of dryers, evaporators, etc.; J. F. Hartz Co., Ltd., Toronto, displayed electric ovens, sterilizers, and a full line of laboratory equipment of their own construction and others of well-known make; Salts & Potash Co., Ltd., of Kitchener, Ont., through their agent, Mr. A. O. Thorne, showed samples of Glauber's Salt and magnesium sulphate (B.P. and technical) from their deposits in Saskatchewan, the samples of Glauber's being specially excellent ones, that caused very favorable comment from the chemists who inspected them; Central Scientific Co., Chicago, with their representative, Mr. L. Redman in charge, had only a small part of their arranged for display, owing to a combination of circumstances over which they had no control (the Central company had arrangements made for a very large display of plant equipment, and their inability to present their full line was very much regretted); the exhibit of the Canadian Industrial Alcohol Co., Ltd., was particularly fine, glass containers being displayed of different grades of ethyl and methyl alcohol; Lymans, Ltd., Montreal, presented exhibits of their well-known lines of laboratory instruments with splendid descriptive literature to explain the same; McKay School Equipment Co., Toronto, displayed school and college laboratory supplies and C.P. chemicals, making a very fine appearance; Westman Press, Ltd. (Canadian Chemical Journal), introduced especially their technical book department to the visiting chemists, showing what they are prepared to do in the way of providing chemists and metallurgists with the latest and best books on scientific and technical matters. Mr. A. J. MacDougall, representing the National Electro Products Co., was present, in charge of their exhibit, and explained the process of manufacture and the varied uses to which their oxygen may be put.

Names of those attending Chemists' Convention other than those from city of Toronto. A complete list of those attending meetings who are resident in Toronto is not available:

Alger, D. H., Corbyville, Ont.; Armes, H. P., Winnipeg, Man.; Babington, F. W., Ottawa; Banks, A. J., Montreal; Baril, Dr., Montreal; Bates, J. S., Kenogami; Bell, J. B., Montreal; Bigelow, Dr., Victoria, B.C.; Blacke, A. F., St. John, N.B.; Blacke, A., Winnipeg; Brewster, T. J.; Burchard, F. J., Winnipeg; Cary-Curr, H. J., Chicago; Charron, A. T., Montreal; Chine, J. D., Ottawa; Collier, F. C., Ottawa; Cook, S. J., Ottawa; Creelman, J. M. Guelph; Crown, H. A., Brantford; Daughters, Mr. R., Brighton; De Beers, F. M., Chicago; Donald, F. C., Montreal; Elworthy, R., Ottawa; Evans, Prof. N. N., Montreal; Fawcett, W. J., Kitchener; Forster, E. L. C., Winnipeg; Frost, G. B., Ottawa; Fulmer, H. L., Guelph; Geddes, W. F., Winnipeg; Gibson, A. L., Guelph; Gilmore, R. C., Montreal; Gilmour, David, Montreal; Glass, L. G., London; Girvin, H. G., Hamilton; Goodwin, L. F., Kingston; Goodwin, Dr. W. L., Kingston; Grimes, M., Guelph; Hambly, F. J., Buckingham, Que.; Hammons, H. S., Woodstock; Hancock, C. W., Kitchener; Harcourt, R., Guelph; Herty, Dr. C. H., New York; Holland, N., Montreal; Jansen, J. T., Ottawa; Kohl; Lehmann, A., Edmonton, Alta; Leverin, H. A., Montreal; Lothup, A. P. Kingston; Macallum, Dr. A. B., Ottawa; MacFee, M. C., Montreal; MacIntosh, Prof. D., Vancouver, B.C.; McIntyre, A. E., Ottawa; MacIntyre, G. D., Montreal; McKee, J. L., Kingston; Mackie, I. C., Sydney, N.S.; MacLean, A. R. M., Montreal; McLaurin, Prof., Saskatoon, Sask.; Mills, H. C., Buffalo; Morales, P. J., Chicago, Ill.; Moore, E., Hamilton; Muir, T. G., Welland, Ont.; Nasmith, M. E., Terre Haute, Ind.; Neish, Prof. A. C., Kingston; Newman, T. C., Wilmington, Del.; Noble, W. G., Montreal; Norton, W. H., Hamilton; Paris, T. M., Coniston, Ont.; Parker, M. A., Winnipeg; Patterson, G. A., Hamilton; Potvliet, Dr., Montreal; Prescott, W. F., Montreal; Redman, L. V., Chicago; Redman, S. L., Chicago; Rigg, W. L., Deloro, Ont.; Roast, H. J., Montreal; Roberts, J. M., Chicago; Ruttan, Dr. R. F., Montreal; St. Georges, Dr. H., Montreal; Shipley, J. W., Winnipeg; Smith, G. M., Montreal; Stansfield, Dr. A., Montreal; Shutt, Dr. F. T., Ottawa; Thorwaldsen, Mr., Winnipeg; Tomlinson, G. H., Hawkesbury, Ont.; Turner, F. M., Jr., New York; Uffleman, Montreal; Vachon, Rev. A., Laval, Que.; Vermilyea, M. L., Corbyville, Ont.; Waddell, Dr. J., Kingston; Waite, F. G., Wardleworth, T. H., Montreal; Wheatley, A. C., Guelph; Williams, J. M., Hamilton; Wilson, Capt. J. C., Oldbury, England; Wilson, R. S., London, Ont.

MEDAL OF SOCIETY OF CHEMICAL INDUSTRY, 1919, AWARDED.

The Medal of the Society of Chemical Industry for 1920 has been awarded to Monsieur Paul Kestner in recognition of his distinguished services to chemical industry. The medal is awarded biennially, and among the recipients in recent years have been:—The Rt. Hon. Sir Henry Roscoe (1914), Mr. C. F. Cross (1916), Sir James Dewar (1918).

Monsieur Kestner was born in Alsace prior to the German occupation in 1871; he was one of the chief founders and the first president of the Societe de Chimie Industrielle in France, which was established in 1917. He has been connected with engineering as applied to chemical industry throughout his career, and among his more notable achievements are the use of forced draught in acid towers, automatic acid elevators, the climbing film evaporator, the scaleless water-tube boiler, and several inventions in connection with beet-sugar manufacture. Very shortly before the armistice M. Kestner gave an address of outstanding interest and importance to the London section of the Society on "The Alsace Potash Deposits and their Economic Significance in relation to Terms of Peace."

Some Aspects of the Rubber Stress-Strain Curve*

Physics as Well as Chemistry Needed to Solve the Rubber Chemists' Problems---The Stress-Strain Relationship of Rubber---Results of Work on Compounding Matarials

By WILLIAM B. WIEGAND

TO the modern University graduate in pure chemistry, rubber technology is a veritable slough of despond. In former days chemistry was taught more as a descriptive science. Nowadays it is taught as a highly deductive mathematico-physical science. Emphasis is placed on generalizations such as the Ionic Hypothesis, the Phase Rule, the Two Laws of Thermo-Dynamics, and so on. No sooner, however, has the graduate entered the ill-smelling portals of a modern mill-room than he finds himself confronted by an industry which is still an art, instead of a science. He has entered a realm where empiricism still reigns supreme.

In this, as in all technology, the rubber chemist passes through three distinct stages, the first of which we can call the test-tube stage. If, as in the case of the present writer, he is introduced to the industry through the laboratory, he begins by familiarizing himself with the customary analytical data and analytical procedures. He learns about the ash content of whiting and magnesium carbonate. He learns about the amount of free acid in sulphur. He learns to look for one-hundredth of one per cent. of free calcium hydroxide in his whiting. All these tests are of interest to him, and he feels that already he is grasping the fundamentals of his industry in some sort of quantitative fashion.

By and by he graduates into the factory. Possibly, as again in the writer's case, he may be consigned to the fragrant depths of the wash-room, and there made to cohabit with hairy camp-followers of Lenine and Trotsky, until such time as he can deliver his twelve or fourteen hundred pounds of washed rubber per day along with the best of them. Next, he may move into the mill-room proper, and there his test-tube ideas receive their final quietus. He wonders why on earth he worried about the second decimal place in the ash of whiting when the mixer in charge of the huge 84-inch mill occasionally spills three or four pounds of this powder down into the shafting. Later on, when he learns something about compounding, he sees mixtures containing, for example, twenty-five pounds of whiting and one pound of hydrated lime. Then he recalls that he used to reject shipments of whiting because they contained one-fiftieth of one per cent. of free lime. He notices that batches frequently contain fifty pounds of zinc oxide, and only a few pounds of sulphur, and that the amount of free acid in his sulphur, which, while in the laboratory, he used to regard as sufficient basis for rejection of whole shipments, is neutralized about a million times over by the zinc oxide or other basic ingredient in the compound as used in the factory.

As the result of these and countless similar experiences, the rubber chemist very frequently throws all of his test-tube methods to the winds, and settles down into the stride of the practical factory man, which is Stage Two—the practical or "works" stage. He learns to talk about thousands of tons of rubber, carload upon carload of this and that ingredient. The word "reclaim" or "regenerated rubber" disappears from his vocabulary in favor of the more homely "shoddy." No longer does he refer to "vulcanization." Now it is only "cure." He absorbs all the wonderful vocabulary of rubber slang. The word "catalyst" sinks to "accelerator," and so on down to "speeder." Zinc oxide becomes "zinc," sublimed white lead "lead." The word "rubber" disappears in favor of "gum." Everything around him becomes either "tacky" or "dry," and "overflow" is only "flash." I think it is safe to say that 95 per cent. of graduate rubber chemists have settled down into this stage of their profession. It is true they get on very well. They are able to pick up the enormous body of empirical knowledge required of the modern rubber man in a substantially shorter time than was required by the old-timer. What took him twenty years they learn in as many months. They are able on demand to dig down a little deeper into the causes of things, and the black art of compounding is occasionally shot through by a faint gleam of systematic insight.

But sooner or later every rubber chemist realizes the inadequacy of this second stage of his profession. Sooner or later he is driven back to first principles. The fascinating mysteries of rubber, the perennial gamble as to the course of its life history, these lead him back inevitably in repeated, if fruitless, efforts to pierce the veil which still enshrouds the fundamental processes of our industry:—He thus reaches the third and final stage. The first stage, you will recall, was the "test-tube" stage, the second stage is the practical or "works" stage, and the third stage is once more *the test-tube stage*. By this I mean that the chemist has had driven in upon him the conviction that, after all, the minute reactions of the laboratory are the factors which really govern the enormous large scale reactions in the factory. True, he now thinks about a set of experiments entirely different from those that engrossed him during Stage One—his first test-tube stage.

Thus his originally warped ideas as to the role played by the chemical constants of his raw materials have now been straightened out and properly balanced by contact with factory practice. He ceases to worry about the free acid content in sulphur, and about the ash of his whiting. He leaves these necessary little details to one of his assistants, who is still passing through the first of the three stages, and who is glad for the training. What he now concerns himself with is questions such as this: "Why do some tires last for three years in this climate, and for only three weeks in the tropics?" "Why does Sea Island Cotton last longer in a casing than the finest of Combed Egyptian?" "Why is it the devil's own job to cure litharge compounds in live steam without spotting the goods?" "By what law of thermo-dynamics does a steam hose tube stock decay under the steaming test?" "Which way should the calendar grain run in a boot tap, and which way in an auto tube?" "How much and what kind of filler should a fellow put into his friction and skim coat compounds?" "Why does everybody make his top cushion of pure gum, when it is flanked on the one side by a stiff ply of body

*Address to Rubber Section, Toronto Branch, Society of Chemical Industry, February 27, 1920, by William B. Wiegand. Director of Manufacturing, Ames, Holden, McCready, Limited, Montreal.

fabric, and on the other by a compounded breaker stock?" "Shall I adopt a black tread, and secure maximum wear at minimum cost, or a white tread and keep my breaker in place, even at a higher cost?" What makes my auto tubes go baggy after a few hundred miles?" "Why the infernal generation of heat in the bowels of my solid tire tread?" "Why all these cracks in my side cushion?"

Research an Aid to the Practical.

These and countless other problems of like difficulty, and yet of cardinal importance, demand explanation and so, research. The practical man will never solve them unaided. They will yield only to the thoroughly trained technologist who has passed through the practical or works stage and who has now reached the stage where he wants to settle down and do some fundamental work.

The question is by what tools is he going to do the job. What advances have in fact resulted from the last decade of published research? Take, first, the reams of papers that have been devoted to plantation research. I mean work such as that of Eaton and his collaborators on the causes of variability. The results of his work have been of cardinal interest to us all, to be sure; and yet Eaton, as you all know, made a mountain out of a mole-hill. Every factory man knows that when he has reduced Eaton's High Sulphur Content, added the customary fillers, and finally drowned the natural nitrogenous accelerator by the addition of a couple of pounds of hexamethylene—when all of this has been done there is precious little variability as to rate of cure left to worry about.

If Eaton had spent more time developing a rubber that could be frictioned properly onto cord fabric without distorting it and yet without losing its tensile properties after the cure, or if he had found out why fine Para makes cements that are about twice as good as any that can be made from plantation gum, he'd have earned our undying gratitude.

Again, take the papers that have been published on organic accelerators. The air is thick with speculations as to how this or that radical reacts with the sulphur. Or does it directly polymerise the rubber molecule? Or does it merely generate nascent or collodial sulpur. Most of us, I take it, are thoroughly weary of all this for the most part conflicting evidence. We have all tried out three or four standard accelerators, have selected one or two which best meet our requirements, have worked out the optimum proportions and vulcanizing conditions, and having done this would fain pass on to some of the other problems referred to a few minutes ago.

Or take the bugbear of the *coefficient of vulcanization*—the most abused term, I submit, in the whole realm of rubber chemistry. Dozens, yes hundreds, of researches have been devoted during the last few yars to this elusive constant which is not a constant. One man finds it an admirable index of state of cure; the next worker finds that the first man forgot to consider aging conditions; then along comes worker number three and proves that neither of the others had allowed for the thickness of the samples during the cure; while finally worker number four comes along and shows that none of the others had allowed the requisite number of months for the acetone extraction of the free sulphur and so they were all wrong. The result is, we know less about the famous coefficient of vulcanization than did C. O. Weber himself. No one even knows how to analyse for it in the presence of metallic oxides.

Finally take that crowning triumph of rubber chemistry, "Synthetic Rubber." The chemist tells us that rubber's correct name is dimethylcylooctadiene, and, to prove it, goes ahead and makes up some. But the dimethylcyclooctadiene he submits to us is no more like fine Para than "Near Beer" is like Molson's Pale Ale.

The point is, that we have been suffering from a distorted vision in our methods of attack upon the great outstanding rubber problems. We have leaned too heavily upon chemistry. We have forgotten that we deal here with a member of that maddening and yet fascinating group of bodies known as colloids. We ourselves are colloids. Every living thing is a colloid. Rubber is a colloid, and indeed rubber is in very many ways a living thing. Its properties change day by day. They are a function, not only of its composition, but also of its life history. From the moment when it issues from the tree, rubber as a colloid begins to lead a life full of whimsical changes. It starts, for example, by being a non-reversible aqueous suspensoid. The moment it is coagulated and dried it becomes a perfectly reversible organo emulsoid.

Physics Needed to Solve Rubber Problems.

Gentlemen, we have got to turn our backs for a time upon our chemical methods, and revert to the good old physics of Victorian days, or we shall never tame this shrew. It is no wonder the chemist has gone so far afield. He is dealing with a substance which has neither melting point nor boiling point, which has no fixed solubility nor even composition. The moment he gets it pure it becomes technically worthless.

It is to physics and physical methods, therefore that we must turn to pin down this elusive body. Rubber does indeed exhibit the most fascinating array of physical properties of any substance listed amongst the world's structural materials. In its unvulcanized condition, it lies on that difficult border line between the liquid and the solid states. Viewed as a liquid, its viscosity demands our attention in the guise of "nerve," as shown in the difficulties of calendering and milling in our factories. Its colloidal memory, by which it retains the imprint of the working received in our mills and calenders, is known to us as "calender grain."

After vulcanization it achieves a tensile strength, which figured on the cross-section at break, may exceed twenty tons to the square inch, thus placing it in the class of mild steel. Coupled with this enormous strength, it shows, of course, a distensibility hundreds of times greater than that of the other materials used in structural work. It is the only substance known for which the elastic limit extends right up to the rupture point. In one regard, few people nowadays realize its extraordinary powers; that is, its "proof resilience," viz., the number of foot pounds of energy that can be stored in unit weight of the material. If you stress a pound of tempered spring steel to its elastic limit, you can store in it 95.3 foot pounds of energy. If you do the same thing with structural nickel steel, you can store only 14.7 foot pounds of energy. Even if you take hickory wood along the grain, you can only tie up 122.5 foot pounds in a pound of the material, but a high-grade soft rubber will store for you upwards of fifteen thousand foot pounds per pound of material, in fact, if you took one hundred pounds of rubber on a bicycle in the form of rubber thread, and wound it up to nearly the elastic limit, I estimate that this would run your bicycle sixty miles before you need re-wind your rubber. This fact was, of course, made full use of in the old days when rubber was used as a buffer in railway work.

Stress-Strain Relationship of Rubber.

Among the many interesting physical properties of rubber, perhaps the most extraordinary is its stress-strain relationship, which brings me to my main topic. The general characteristics of the rubber stress-strain curve are, of course, familiar to everyone. They were first described in detail by Villari in 1869. Hooke's Law of proportionality of stress to strain, which is universally true of most of the structural materials within their elastic limits is of course not valid. The ratio of stress to strain is constantly changing. In other words, Young's modulus of elasticity is in the case of rubber not a constant but a rate. Nevertheless, rubber is the only substance for which Young's modulus is anything else than a mathematical calculation. You can actually measure Young's modulus in the case of rubber, because you can stretch it to twice its length and measure the stress required to do so.

I said a minute ago that rubber is the only substance for which the elastic limit extends out as far as the actual rupture point. Whereas, in the case of metals, the first part of the curve is stiff and the later parts show a yielding region, vulcanized rubber is yielding at first but stiffens or tightens up later on. It shows, as it were, a hand of steel encased in a silken glove. These extraordinary stress-strain relationships of rubber attracted the attention of some of the most brilliant physicists of the 19th century.

The most exhaustive and at the same time masterly studies of the elastic properties of vulcanized rubber were carried out by Prof. H. Bouasse of the University of Toulouse, who published his memoir in 1904. Bouasse had carried out extensive work on the elastic properties of other materials and was attracted to rubber by the unequalled large scale of its properties of extension. He saw an opportunity of, as it were, magnifying the ordinary elastic constants and being able to study the phenomena of hysteresis and of the effect of temperature on these properties to better advantage. Bouasse worked in the main with pure gum mixings only—i.e., those containing only rubber and sulphur. It is a matter of infinite regret that the early masters who did such basic pioneer work on the physics of rubber knew so little about the industry, and in consequence failed to give the exact state of cure of their samples, and, what is more to be regretted, took no cognizance of the character or degree of mineralization of their material.

The following figures will illustrate some of the physical apparatus used by Bouasse and others in the accurate measurement of the all-important elastic moduli at various points along the stress-strain curve. For details you must consult the original memoir.

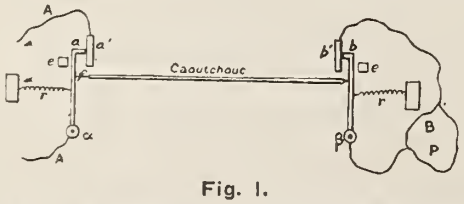


Fig. I.

Rate of Propagation of Longitudinal Waves.

This apparatus was used in 1872 by Stefan and later by Exner, for determining the elastic modulus of vulcanized rubber by measuring the rate of preparation of longitudinal vibrations. The rubber thread is stretched between the metallic bars A and B, which are free to move around their axes, α and β. In the beginning of the test, the circuit A is closed and the circuit B is short-circuited. The silk thread fastening the rubber to the piece A is then burnt through. Immediately the circuit A is broken, and a chronoscope begins recording. A longitudinal wave then advances along the rubber thread, diminishing the tension along it. After a short space of time, when the wave has reached B, the spring R separates B from B', opening the short circuit and thus closing the circuit B, which again registers on the chronoscope. The elapsed time is thus recorded between the two ruptures A A' and B B'. The length of the rubber thread divided by this time gives the velocity of propagation of the longitudinal wave. Since

if E be the elastic modulus, $V = \sqrt{\frac{g\,E}{\delta}}$ or $E = KV^2$.

Bouasse subjects the validity of the results obtained by this experiment to very trenchant criticism. For example, the tension varies all the way from its initial value to zero, or that of the spring R, so that the resultant value of the modulcs cannot be identified with any one point on the stress-strain curve. Again, the rapidity of the experiment raises the question as to whether the modulus is an adiabatic or isothermal one. The effects of hysteresis and the secular changes due to the elastic after-effect, in his opinion, severely detract from the value of this method.

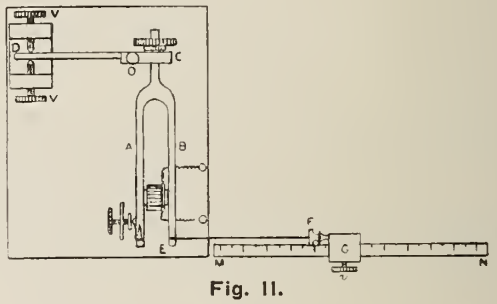


Fig. II.

Stationary Wave Method.

This figure clearly shows the set-up. The rubber sample EF is stretched to various degrees and is given longitudinal impulses by an electrically maintained tuning fork. A stationary wave is formed, and the internodal distance is readily measured on the attached scale. This method is interesting theoretically. The wave length taken together with the period of the tuning fork allows the calculation of the velocity of propagation, and as before, $E = KV^2$.

Bouasse points out here again that the phenomena is altogether too complex to yield accurate results by such simple treatment. The amplitude of the vibrations rapidly diminishes away from the tuning fork. Energy absorption, because of hysteresis, is thus a severe disturbing factor. The result is that the experimental accuracy of determination of the internodal distance is not high. The method is, of course, convenient, and as Bouasse puts it, "d'une incontestable elegance."

Fig III.—(See Fig III.)

Determination of Modulus by Simple Pendulum.

The simple pendulum oscillating about the point O, has attached to it a stretched rubber thread AC, fastened exactly in its centre B, to the pendulum arm. The points A and C are so chosen as to give the rubber sample any pre-determined elongation. When the pendulum is set in motion, one-half of the rubber sample sustains a slight increase in

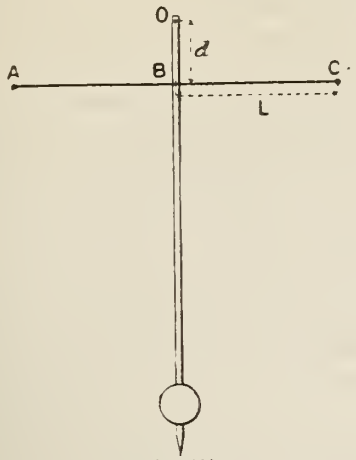


Fig. III.

tension and the other half a corresponding diminution in tension, the result being that to the restoring couple due to gravity there is added an additional restoring couple due to the rubber, and having a numerical value of $2\epsilon d^2\theta$, where ϵ is one form of the elastic modulus. The modulus can thus be calculated by a simple measurement of the period of oscillation, first without and then with the sample of rubber attached.

It will be observed that this experiment, as also the two previously described, offers a means of determining what Bouasse calls the dynamic modulus, or a modulus determined at a substantially constant elongation, by repeated slight changes in load. The method of Fig. III. was also used by Mallock in determining the elastic properties of rubber. It has, however, the almost fatal defect that, owing to hysteresis, the energy of the pendulum is so rapidly damped down or degraded as seriously to vitiate the accuracy of measurement of the period of vibration.

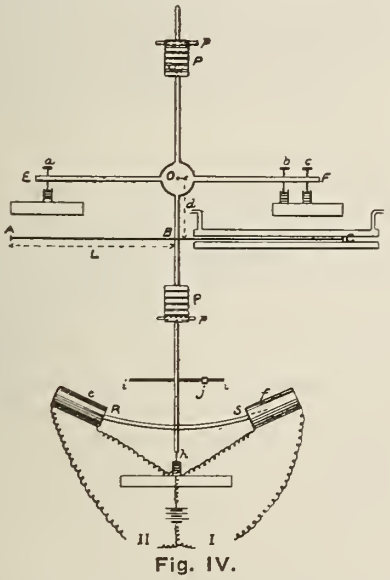


Fig. IV.

In this diagram is shown the specially built pendulum devised by Bouasse for overcoming the errors inherent in the simple pendulum shown in Fig. III. Briefly, O is again the centre of oscillation, and AC the rubber sample. Concentric with O is the arc RS, which is alternately attracted by the electro magnets e and f.

The bar EF carries contact points a, b and c, dipping into mercury cups and so completing the electric circuits which energize the solenoid magnets.

By a special device (not shown) the magnetic impulses are accurately timed so as to occur exactly as the pendulum is passing the neutral position. *In this way there is no disturbing effect on the natural period*, the effect being merely to maintain a constant amplitude.

By the aid of this superbly designed instrument, Bouasse was able to give exact form to many general laws hitherto appreciated vaguely, if at all. Cycles of extension and retraction were traversed and at suitable intervals the elastic modulus determined by measuring the duration of a definite number, say 20, swings of the pendulum. Measurements of the energizing current through the solenoids supplied data as to the energy losses due to hysteresis in the rubber. The following are examples of Bouasse's well-established generalizations. They are valid both for pure gum and for heavily compounded mixings.

1. The elastic modulus decreases with increasing elongation, passes through a minimum and then increases rapidly up to the breaking point.
2. As the cycles are repeated the modulus corresponding to any given elongation decreases: first, very quickly, then slowly, finally reaching a practically constant value. Thus, in arbitrary units, a series of values for the first three cycles (at a given elongation) were 816, 535, and 460.
3. The hysteresis in the moduli is also very great after the first cycle, but is already small in the third cycle, and after five cycles is almost gone.

Perhaps Bouasse's broadest generalization, and one which has profound technical significance, is the following:—

> "Every stretching of vulcanized rubber, every reduction in length, in general every change of form, tends to diminish the value of the modulus corresponding to any given elongation. Also every rest tends to augment it and this augmentation increases in proportion as the position of rest is nearer to zero extension."

Practical illustrations of this will occur to all of you. A stiff rubber band can be "softened" by a few preliminary stretchings. A laboratory test piece which slips out of the jaws of the testing machine before rupture gives, on re-testing, quite abnormal values. In short, the physical properties of vulcanized rubber (as of course those of crude rubber) are a function of its previous life history.

Other ingenious experimental methods were used by the early workers to determine the elastic moduli.

Compression Modulus of Spheres of Rubber.

In 1886 Schneebeli determined the compression modulus of spheres of rubber by measuring the diameter of the circles produced by various weights applied to the spheres. The experimental accuracy was good. The variations from the mean were less than 4%.

Impact of Rubber Cylinders.

Another suggestive piece of work in this connection was the determination, in 1881 and later, by Boltzman and his pupils of the conditions of impact of two rubber cylinders. The duration of the impact and extent of rebound are a function, among other things, of the rate of propagation of longitudinal waves through the rubber substance and, therefore, also a function of the elastic modulus.

Hysteresis.

Let us now for a moment turn to the question of the retraction curve, which, as everyone knows, differs markedly from the extension curve. The area contained be-

tween the two curves is called the Hysteresis Loop. There is no more important quantity in the whole rubber technology than the area of this hysteresis loop. Boileau, in 1856; Villari, in 1869, and, above all, Bouasse and Carriere, in 1903, have, along with others, been pioneers in the study of hysteresis. These workers found that the hysteresis diminished as the number of cycles increased, and finally reached an approximately fixed value. The difference between the first two cycles was greater than that between any other two. Schwartz found, in 1910, that the area of the loop became fixed sooner in a high grade than in a low grade of rubber. He also found that when cycles were generated to a constant final load, the increasing extension at the end of each cycle was proportional to the logarithm of the number of the cycle in question. Also, and naturally, these workers found that the shorter the extension the narrower was the hysteresis loop.

Another general rule laid down by Bouasse and confirmed by Schwartz is that the greater the speed of generation of the cycle the greater will be its area. You will at once appreciate the significance of this in regard to the internal heating of solid tires. Not only do excessive driving speeds multiply the number of hysteresis loops per second and, therefore also the heat liberated, but they also actually increase the calories of heat generated *per revolution of the wheel.*

One aspect of hysteresis is at least encouraging, viz., that the area of the loop diminishes with increased temperature. We may be thoroughly thankful that the converse is not the case. Our solid tires and the breaker strips in our pneumatic casings would go to pieces in no time if there were not this compensating law. Incidentally this temperature relationship strongly suggests the resemblance in many respects of rubber to a viscous liquid. In fact, Shedd and Ingersoll use the term "viscosity loop" rather than hysteresis loop for this reason.

Thermal Phenomena.

We shall now consider briefly some of the remarkable thermal phenomena associated with the mechanical working of rubber. Away back in the year 1805, Gough recorded in the memoirs of the Manchester Literary and Philosophical Society, that when he stretched a strip of rubber and held it to his lips it felt warmer than before stretching. Page, in 1847, made the same observation. Finally Joule also recorded the fact that while metals and other materials cooled on stretching, rubber, on the contrary, warmed. Lord Kelvin applied Le Chatelier's principle of equilibrium and predicted that if this was so, stretched rubber must contract on heating. Joule confirmed this by actual experiment, and the effect is now generally known as the Joule effect. Interestingly enough, the very first stages of extension are accompanied by a slight cooling effect. The corresponding cooling which accompanies retraction of the stretched rubber is definitely less than the heating effect on the extension. This difference representing the net increase in thermal content of the sample is the exact equivalent of the hysteresis loop, to which I have already referred. This heat must be attributed to internal friction in the rubber.

It may be of interest to compare the thermodynamical behavior of vulcanized rubber with that of better understood systems. *Gases* when expanded or compressed isothermally develop pronounced thermal effects. In fact, the energy expanded during compression, for example, is all turned into heat. *Steel springs*, on the other hand, are examples of systems which develop practically no thermal effects when deformed. All of the work done on the system appears as potential energy of strain.

Now vulcanized rubber is intermediate between a gas and a steel spring. When rubber is stretched the work done turns partly into potential energy of strain and partly into heat.. In the case of an ideal rubber or compound (i.e., one which shows complete reversibility), *all* of the heat liberated during extension will be reabsorbed during retraction and likewise all of the work done will be regenerated, thus leaving the sample in the same thermal as well as mechanical state as it was before stretching. Such a rubber would not heat up in a casing or solid tire any more than would a perfect gas, when alternately expanded and compressed. There would be no hysteresis. Actually, of course, the heat is not completely reabsorbed and the energy is correspondingly reduced. It is thus convenient to keep in mind the two thermal values involved in any cycle of extension and retraction, viz., QR or Reversible heat and QF or Frictional heat, which is non-reversible and which accumulates when a rubber article is subjected to repeated strains.

The production of rubber compounds and cures for which QF is a minimum should be one of the focal researches for us all. The profound effect of mineral additions upon this quantity is already a part of technical knowledge. The fundamental reasons for this inter-relationship are deserving of our best thought. They lead us into the arcana of rubber structure.

Inversion Points.

In 1898 Lundal discovered that if a given load was applied to a rubber sample under gradually increasing temperatures, there was one temperature at which the addition of the load in question would cause no heating, and in fact above which it would produce cooling. Conversely at any given temperature he found that there was a critical load at which there would be no thermal effect. The lower the temperature the lower was the value of this critical load. Thus in a particular example raising the temperature from 18° C to 58° C increased the critical load from 44 to 102 grams.

The technical importance of these points of inversion in the Joule effect is manifestly very great. Suppose, for example, we could so adjust the thickness of the friction and skim coat between the plies of fabric in our casings as to bring the actual strains on the gum stock in actual service on the road to the critical point of inversion. Under such conditions there would be no thermal effect, no heating up of the stock, no perishing, no ply separation. Obviously it will be worth millions of dollars to our industry to conduct a successful research along the lines of determining the situation of these critical or neutral points as the state of cure and composition of the various mixings are systematically varied.

Cause of Joule Effect.

Some interesting conjectures as to the ultimate structure of rubber were advanced in connection with attempted explanations of the Joule effect. Govi, in 1867, suggested that rubber consisted of a sort of solid foam, made up of innumerable cells filled with gas. When the rubber is stretched the cells lengthen out. When heat is then applied, the gas expands and urges each cell to resume its original spherical shape. Subsequent experience showed the impossibility of this hypotheses.

A more plausible theory is that of Fessenden, who pictures rubber as composed of cells with solid envelopes and containing a viscous liquid. There is strong collateral evidence that this is a highly stimulating hypotheses of rubber structure. It applies equally well to other colloidal gels which display similar negative temperature coefficients when in a stretched condition.

Another explanation of the Joule effect is that of Schmulewitsch, which assumes that the shortening of the stretched rubber is due to an increase in the elastic modulus with increasing temperature. However, later work, in particular by Bouasse, disproved this theory and showed in fact, that Young's modulus grew smaller with increased temperature.

Time will not permit of reference to some other fascinating phenomena related to the stress-strain properties of rubber, such as electro stricture or the mechanical movements of stressed rubber under the influence of an electrostatic field, the phenomena of Double Refraction, and of selective spectral absorption. For a discussion of these and many other matters, I would refer you to a forthcoming volume by Prof. G. S. Whitby of McGill, whose advance manuscript was very kindly loaned by the author and to which I am indebted for the major part of the historical matter referred to this evening.

Schidrowitz, on Testing of Crudes.

Coming down to more recent work, you are doubtless all familiar with the Schidrowitz method of comparison of crudes by means of their stress-strain curves. The secrecy which for about five years has surrounded his methods has only recently been lifted and we are now invited to follow his reasoning. Schidrowitz starts with several experimental findings:

He first notes that the stress-strain curves for the same mixing, but with advancing cures, come regularly down the paper and never intersect. The stiff parts of the curves are moreover parallel to each other.

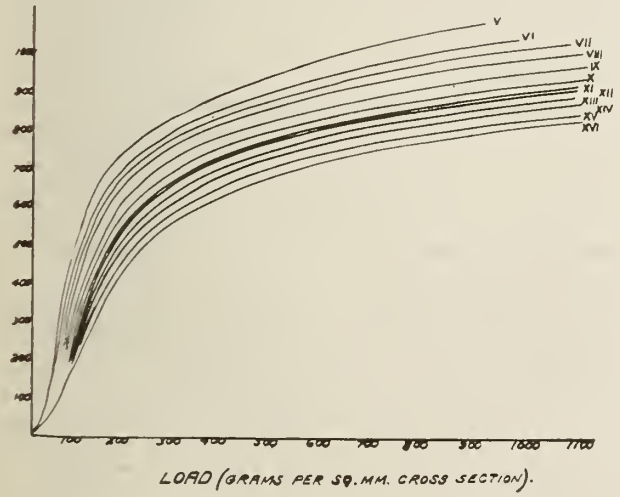


Fig. VI.

Second, the inclination or slope of the final part of the curve is an index of the quality of the crude rubber under test. The flatter the curve, i.e., the less the slope, the better the crude as ordinarily estimated.

Schidrowitz thereupon set himself the task of giving precise mathematical expression to these facts. Being rusty in his mathematics, he invoked the aid of Mr. Emil Hatschek, one of the best living colloidal chemists. Hatschek studied the trend and general character of the curves and found that they could be made to fit in with the interesting family of curves known as Conchoids, the polar equation of which is $(R+B \cos \theta = A$.

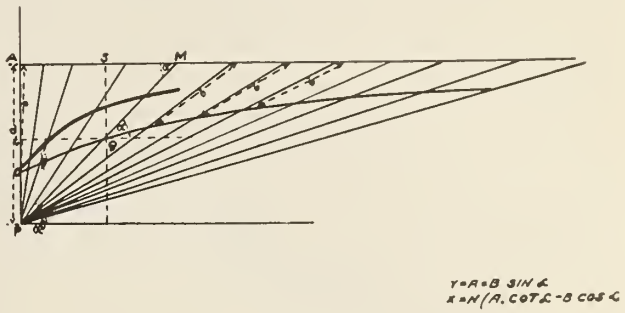


Fig. VII.

The above cut, taken from the original paper, shows the same curve referred to Cartesian co-ordinates, in which case the equation becomes:—

$$y = a - b \sin \alpha$$
$$x = n\ (a \cot \alpha - b \cos \alpha)$$

For details of the transformation, reference should be made to the original paper. The three constants which govern the trend of these curves are a, b and n.

a, the distance from the pole to the asymptote has, in a general way, the effect of opening out the scale of the curves. Using Hevea rubber and an 8% pure gum mixing, Schidrowitz found that he could get curves to fit properly if a was made equal to 10.5 on the elongation scale.

b, the distance between the origin of the curve and the asymptote clearly represents the utmost possible elongation of which the rubber would be capable if its stress-strain curve could be extended to infinity.

Fig. VIII.—(See Fig. VIII., page 166.)

In order to explain how the changes in the constants a and b, affect the position of the conchoid curve, we have drawn a series of curves with a=7½, varying b from 1 to 12. Keeping in mind that in order to compare the position of the curve with the crude rubber curve the origin must in each case be brought to the same point, we see that with very low values of b, the curve lies low down on the paper. As b is increased, the curves move upward exactly as do the curing curves shown in Fig VI. The final parts of the curves also remain parallel. When b is made greater than a, loops are developed, and by suitably selecting the origin, the curves can be brought still higher up. In other words, the position of the crude rubber stress-strain curve, varying as it does in accordance with the cure, can be duplicated in the case of the conchoid series by increasing or diminishing b. It is, however, noteworthy that points of inflection only appear when b is less than a. When b equals a, a cusp is generated, and when b is greater than a, a loop. These conditions do not find any precise counterpart in the crude rubber curves, and to this extent the conchoid analogy falls down.

If b is fixed and a is decreased, the effect is to flatten out the curve corresponding to a stiffer rubber. For this reason Schidrowitz regards a as a measure of the toughness or "tenacity" of the sample.

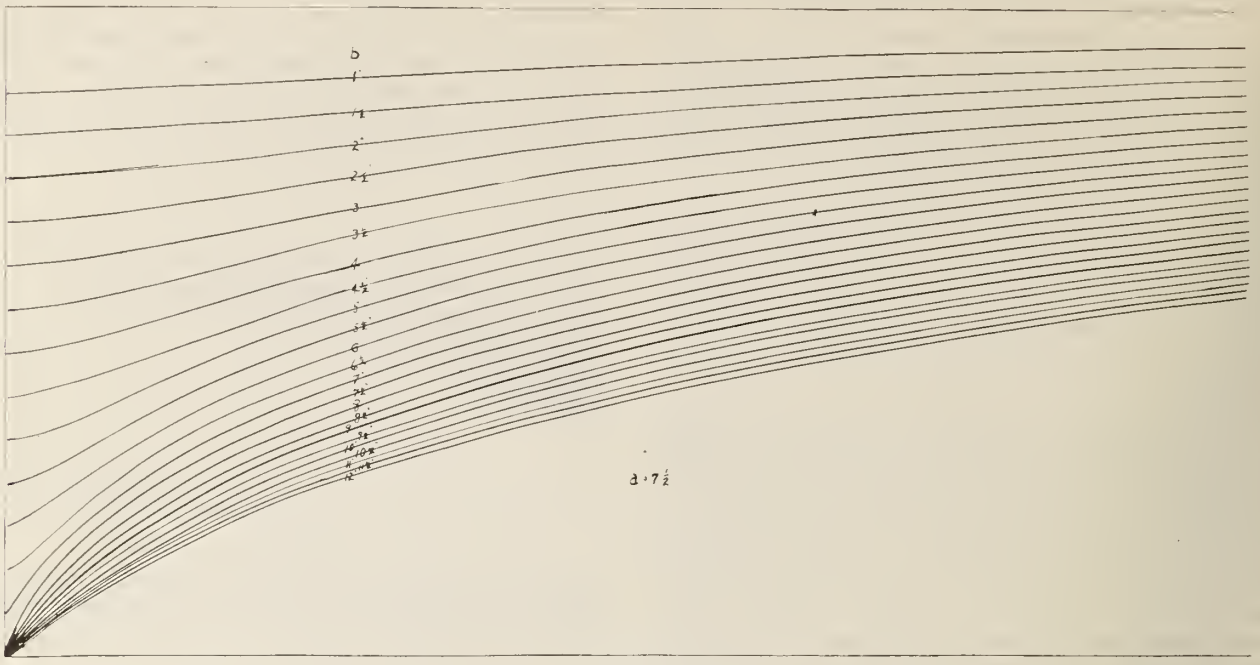


Fig. VIII.

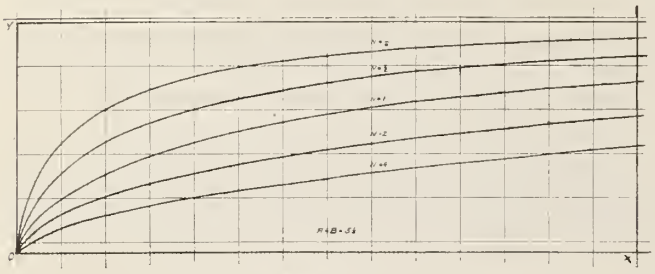


Fig IX.

"n"

In this figure is shown the effect of changing the third constant "n." When n is .5 the abscissa (or load) corresponding to a given ordinate (extension) is cut in two. In other words, the extension per unit load is twice as great. At the same time that part of the parent conchoid which is approaching the asymptote is drawn in twice as close to the origin. Thus as n decreases, the slope of the first part of the curve is increased whereas the slope of the final part of the curve is diminished.

Now it is actually a fact that the higher the grade of a plantation crude the flatter will be the final part of its curve. Consequently Schidrowitz has definitely adopted n or in fact the product "an" (since a is constant for any set of curves) as the numerical index of the type. For convenience he actually measures the slope by taking two points well on in the curve and noting the change in the elongation. He finds that any given grade of crude will yield a fixed and constant value for "an" or type. A high grade first latex will give the figure 33. A weak off grade sample will go as high as 45.

The Perfect or Correct Cure.

The most startling part of Schidrowitz's paper is his mathematical definition of the correct cure. You will recall that as the cure advances the curves come down the paper in parallel fashion. The slope is fixed. That is the constant "n" is fixed. Now "a" is experimentally found to be constant at 10.5 on the elongation scale. Consequently the only thing left is to change "b." Schidrowitz states that the correct cure is the one when "b" equals "a." "a" represents toughness. "b" represents maximum extension. Obviously, says Schidrowitz, when these two quantities equal each other the rubber will be properly balanced as to physical properties, and this must correspond to the correct cure!

I think that you will agree with me that the reasoning behind this sweeping statement is just a bit inadequate. This should not worry us, however. The fact is that Schidrowitz checked up these "perfect" cures against the orthodox criteria of optimum tensile strength or optimum tensile product, and found he was not very far out. The whole work is very ingenious and doubtless the type or slope index will meet with wide adoption. As regards the "perfect" cure, I think most of us will adhere to our present criteria rather than trust entirely to the conchoid constants a and b.

These few references to physical researches on rubber may serve, however imperfectly, to illustrate the technical importance of developing physical methods of attack. I have already made reference to the regrettable paucity of information regarding the grade of rubber, state of cure and, above all, exact composition of the specimens used in the various experiments.

Joule, Kelvin, Bouasse, Rontgen and the other master physicists were interested mainly in the correlation of the properties of rubber *as rubber* with those of other materials. We, on the other hand, are vitally interested in knowing how one rubber and one compound differs from another in its physical properties. Reference will therefore be now made to some of our own experiments designed to bring out the comparative behavior of a few of the more generally used inorganic compounding ingredients. These included Carbon and Lampblack, China Clay, Red Oxide, Zinc Oxide, Glue, Whiting, Fossil Flour, and Barytes.

Basic Mixing.

In order to avoid the tedium of doing a whole series of cures for each mixing, a base mix was developed containing:—

Fine Para	100	parts by weight
Litharge.	30	" " "
Sulphur.	5	" " "

By volume this works out at:

Rubber.	100 volumes.
Litharge.	3 "
Sulphur.	2½ "

In this mixing the accelerator and sulphur are so balanced as to preserve a practically flat curing condition over a range of cure from 15 to 45 minutes at 40 pounds of steam. To this base mixing increasing amounts of each pigment were added on the volume basis. The additions were continued until the stock grew so dry and leathery on the mill as to be unworkable. The cures were made in an ordinary laboratory press and the test pieces stretched on a Scott machine. The stress-strain curves were obtained with surprising accuracy by one observer calling out the dial readings corresponding to each increment in elongation as called out by a second observer. The well-known inaccuracies of the ring test piece as used in the Schopper machine were thus avoided. Duplicate tests made by different observers checked well within the mechanical accuracy of the machine itself.

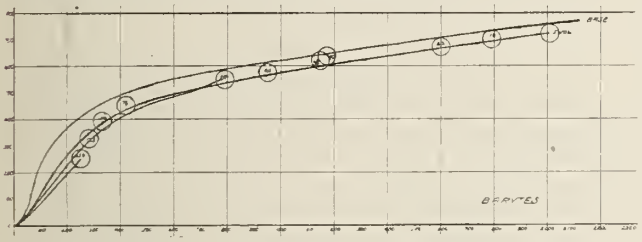


Fig. X.

Barytes.

Note the unchanged curvature of the base mixing curve. Increasing additions of this pigment have merely the effect of shortening the curve. Barytes is nothing but a diluent. It adds no useful property to any compound, but on the other hand detracts from both the tensile strength and elongation. For this very reason very large proportions (up to 150 volumes) could be incorporated into the hundred volumes of rubber before the stock became unmanageable. Everybody knows that when you are selilng goods by the pound Barytes is the pigment to use. This explains why!

Fig. XI. (See below.)

Fossil Flour.

This pigment shows signs of disturbing the basic stress-strain curve. There is less curvature. The curve has moved toward the "Load" axis. A compound containing Fossil Flour is definitely stiffer than one containing Barytes. However, after 30 volumes have been added there is no more rotation of the curve, which merely shortens, as in the case of Barytes. Now the Fossil Flour particle is smaller than the Barytes particle, and, in our opinion, the change in behavior after 30 volumes is most simply explained by assuming an agglomeration of the Fossil Flour particles, at this stage, into larger complexes, generating less rubber surface. The total quantity absorbed by the gum was in this case only 75 volumes.

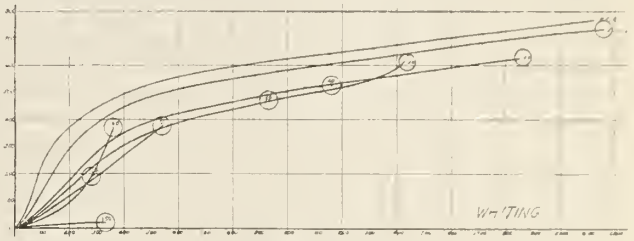


Fig. XII.

Whiting.

Here again the curve shows some displacement (stiffening) up to an addition of 20 volumes of the pigment. Thirty volumes adds nothing to the effect, and we assume that between these two volumes agglomeration has set in. The maximum absorption of pigment was in this case 125 volumes. Any of you who use more than 20 volumes of Whiting in a compound must disclaim any beneficial effects on the physical properties.

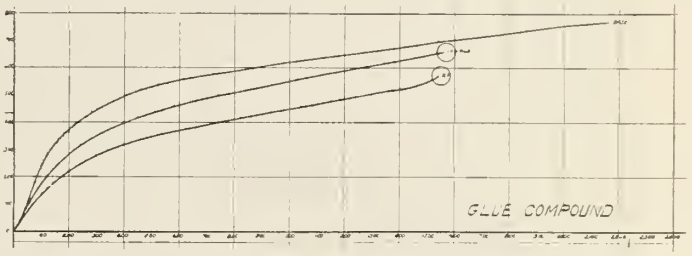


Fig. XIII.

Glue.

This was added in the jelly state. Up to 20 volumes there was a definite displacement of the curve indicating that Glue is not a mere diluent, like Barytes, but exerts a definite stiffening or toughening action in a compound. The tensile at break is, however, lowered.

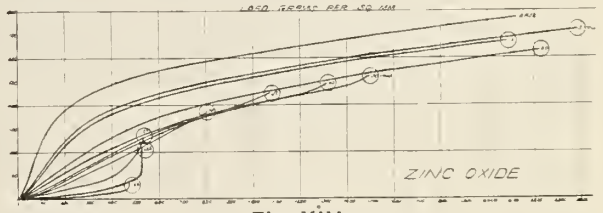


Fig. XIV.

Zinc Oxide.

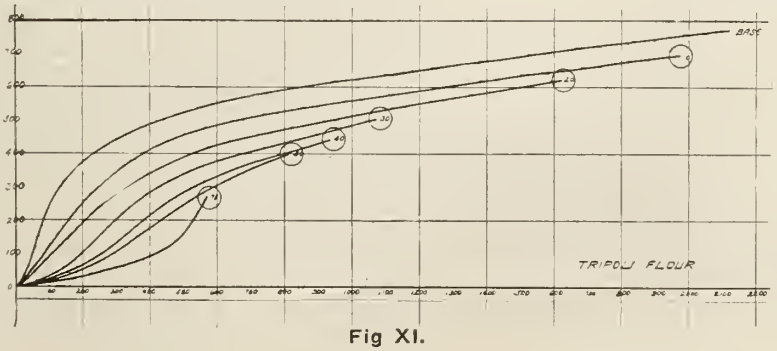


Fig XI.

This pigment shows a marked re-inforcing or stiffening effect on the compound. The tensile strength at rupture is maintained undiminished up to a volume addition of 20 volumes.

Beyond this the curve recedes, as in the case of Barytes. Agglomeration of particles has set in. Up to 20 volumes Zinc improves wearing power. Beyond this it partakes more and more of the characteristics of a diluent. Most of you are making daily use of this in factory practice. Your best white treads contain not much more than 20 volumes of Zinc to 100 of rubber.

The maximum absorption was in this case about 125 volumes.

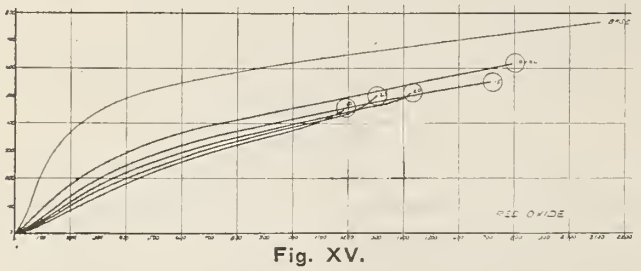


Fig. XV.

Red Oxide.

This useful (and sometimes treacherous) pigment shows a re-inforcing action up to 15 volumes. Beyond this is agglomeration. The tensile does not hold up so well as with Zinc.

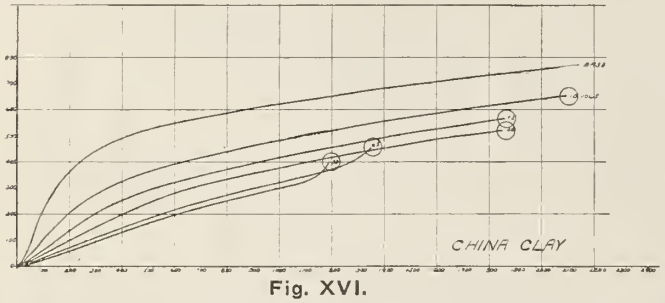


Fig. XVI.

China Clay.

China clay vies with Zinc Oxide as a re-inforcing agent. The rotation of the curve is even more marked than with Zinc, although the breaking tensile is less well maintained. Twenty volumes again represents the maximum loading without detracting from the physical properties. Naturally, Clays differ markedly according to their origin and colloidal condition. The above result must be regarded as only an individual finding.

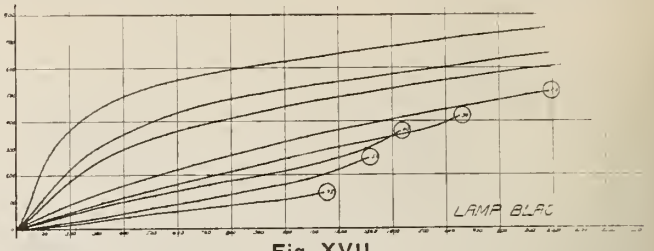


Fig. XVII.

Lampblack.

We now approach royalty in the pigment realm. Note the steady, clear-cut, downward progression of the curves toward the load axis, indicating greater and greater toughness. And yet the breaking tensile holds up splendidly. A stock containing 20 volumes of Lampblack possesses stress-strain properties resembling in type those of steel and other rigid bodies; the curve is practically linear, i.e., Hooke's Law applies. There is none of the usual flabbiness at low elongations. It is no wonder such a stock wears better as a tire tread than one made up even of Zinc Oxide or the finest grade of China Clay.

Beyond 20 volumes, however, aggregation again supervenes and the pigment reverts to the Barytes class.

Fig. VIII. (See below.)

Carbon Black.

We come now to the king of pigments. The re-inforcing qualities of lampblack are here displayed in superlative degree. Instead of being diminished or at best maintained, the breaking tensile is markedly improved. Linear (Hooke's Law) stress-strain conditions begin early and continue unabated up to 40 volumes.

Particle aggregation, with resultant collapse of the re-inforcing effect is postponed to 40 volumes, which is, of course, unapproached by any other pigment.

Numerical Measure of Re-inforcing Action.

The question now arose as to a suitable quantative means of assessing the toughening effect of these various pigments on compounds containing them in varying amounts. One method consisted in measuring the rotation or displacement of the curve toward the load axis by simply taking the height (or elongation) at a definite load, say of 16000 grams per sq. mm. The trouble with this method was of course that it took no account of the lowering of the tensile at rupture, which property varies greatly with different pigments.

The method finally chosen was developed by a consideration of the conditions governing the phenomenon of

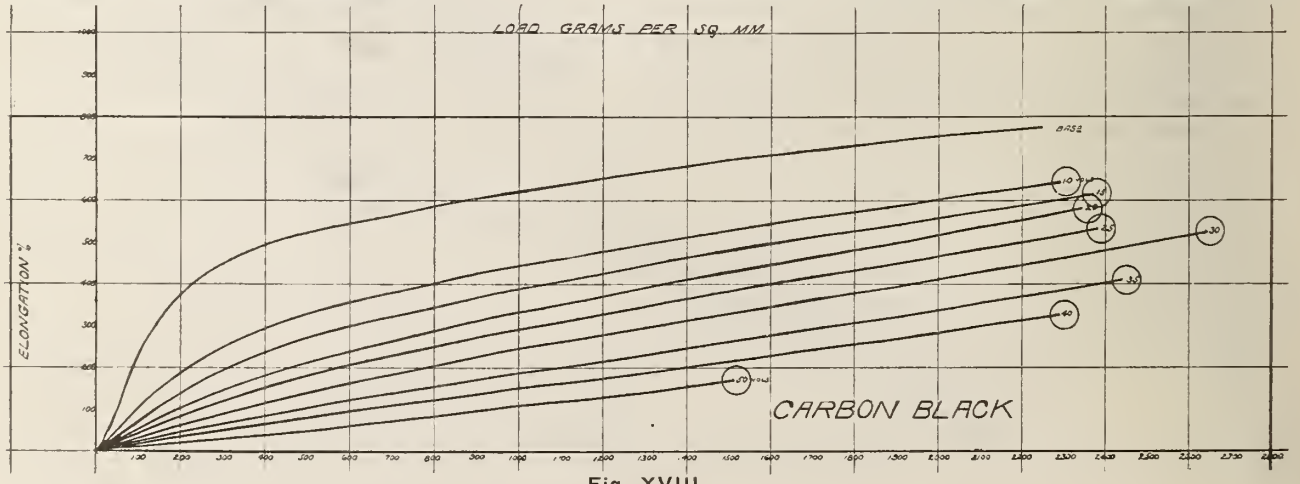


Fig. XVIII.

abrasive wear. Take for example an automobile casing tread. "Wear" here consists in the gouging or tearing out of small masses of gum, due to impact upon the road surface. Now a numerical measure of impact is the work done on each little mass of rubber. *If this work can be stored up without stressing the rubber substance past its rupture point the mass will stay in place. The less energy it can so absorb, the easier it will be torn from its moorings.*

Now the energy absorption is in each case represented by the area contained between the stress-strain curve and the elongation axis. This area was therefore measured by a planimeter and the results calculated to foot-pounds per cubic inch of original stock.

Fig. XIX. (See below.)

The curves below show the remarkable results obtained Foot-pounds per cubic inch are plotted against volume percentages of pigment added to the base.

The base mix stored up 450 foot-pounds. The addition of Barytes continuously diminished the energy content. Fossil Flour, Glue, Whiting and Red Oxide all behave in essentially the same manner. China Clay, however, is capable of slightly increasing the energy content. Zinc Oxide and Lampblack run neck and neck, showing marked increases. Carbon Black is again the winner, and if not added in excess of 25 volumes may increase the energy content up to nearly 150% of it original value.

Specific Surface.

These facts point at once to the conclusion that the presence within the rubber matrix of a disperse phase, such as Carbon Black, which must be regarded as chemically inert, may nevertheless profoundly alter the characteristics of the system.. The subjoined table indicates almost beyond a doubt that these effects run parallel with the specific surfaces developed by the various pigment phases.

Fig. XX. (See page 170.)

The particle diameters here shown were determined miscropically and are of course only approximate, particularly in the case of the finer pigments. The surface developed per cubic inch of pigment was in each case calculated from the observed average diameter of the particles. The values range from 30,000 (Barytes) to 2,000,000 (Carbon Black), and if, for simplicity, we assume that the adhesive force between the rubber substance and the pigment is the same in all classes, the enormous differences in the area of contact are alone sufficient to account for the striking differences in physical properties.

As a matter of fact Zinc Oxide increases the energy absorption of a compound to a greater degree than would be accounted for by its specific surface, and it is safe to assume that in this case there is also an exceptional surface tension behavior.

Work of H. F. Schippel.

Finally, I wish to refer to the fundamentally important work done by my colleague, Mr. Schippel, in which he showed that, contrary to general assumptions, compounded rubber under strain undergoes relatively large volume increases which must be attributed to a separation of each pigment particle from its rubber matrix, doubtless forming a vacuum at each pole.

For details of his methods, reference must be made to the original paper. He found increases, at for example 200% elongation, ranging from 1.5% for Carbon Black to over 13% for Barytes. The volume increases ran roughly paralel with the size of the pigment particles, Zinc Oxide again occupying an anomalous position.

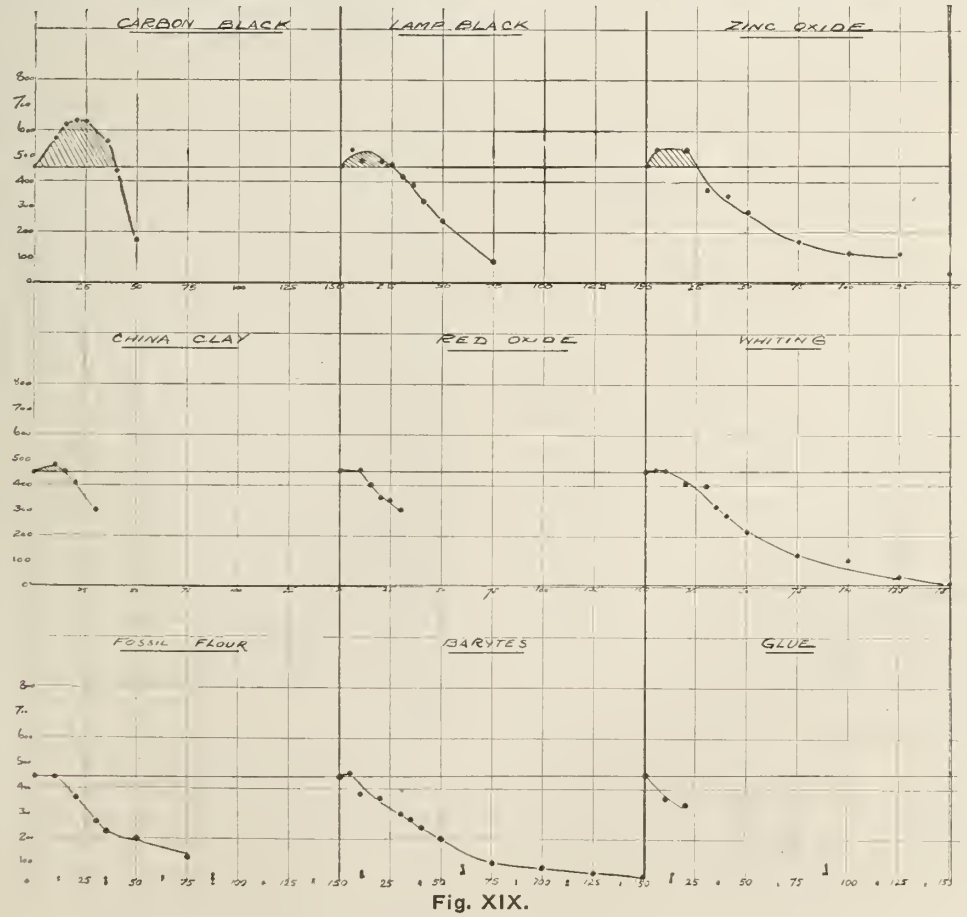


Fig. XIX.

Schippel's results throw a clear light on the mechanism of the re-inforcing action of the finer pigments. These resist the increase of the Free Surface energy necessary to separate them from their rubber matrix. When a Carbon Black stock is stressed to rupture the work done on the rubber phase must be increased by an amount representing the increase in surface energy required to separate each particle of carbon from its surrounding bed of rubber. In the case of a coarse pigment, such as Barytes, this increase in surface energy is negligible.

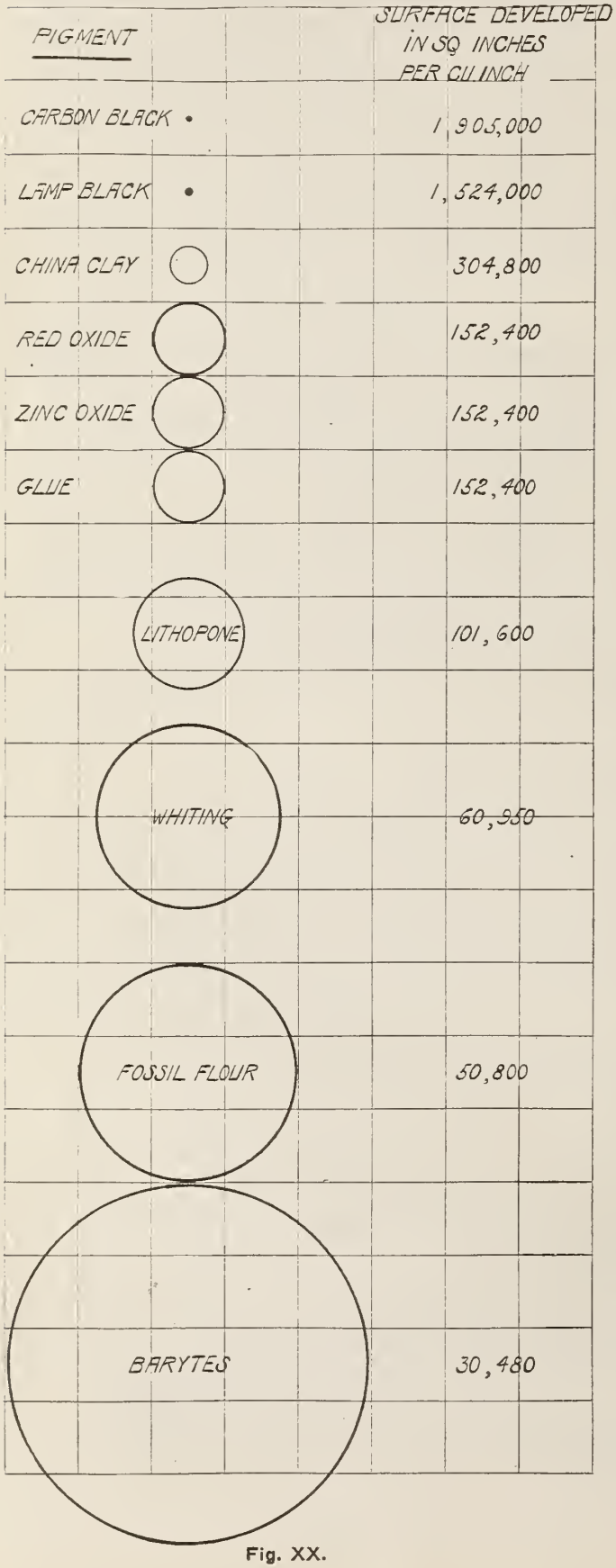


Fig. XX.

The fact that with the finer pigments the rubber remains nearly uniformly anchored, instead of pulling free along the poles of each particle, must also result in a more uniform stress on the pure rubber phase and so contribute materially to the enhanced tensile properties and "energy capacity" of the compound.

It is hoped at an early date to make a more careful and detailed study of the surface energy relations involved in the properties of compounded rubber.

PIGMENT	APPARENT SURFACE	DISPLACEMENT OF S.S. CURVE	TOTAL ENERGY OF RESILIENCE	VOLUME INCREASE @ 200% EL.
CARBON BLACK	1,905,000	42	640	1.46%
LAMP BLACK	1,524,000	41	480	1.76
CHINA CLAY	304,800	38	405	
RED OXIDE	152,400	29	355	1.9
ZINC OXIDE	152,400	25	530	0.8
GLUE	152,400	23	344	
LITHOPONE	101,600			
WHITING	60,950	17	410	4.6
FOSSIL FLOUR	50,800	14	365	3.5
BARYTES	30,480	8	360	13.3
			BASE 450	

Fig. XXI.

In the above table are brought together for convenience the various properties already referred to, for mixings containing in each case 20 volumes of pigment.

Taken in conjunction with the well-known wearing properties of the various compounds, this table will, I think, bring out the fundamental causal connection between toughness or abrasive power, capacity for storing work, and bond between particle and rubber matrix; all three of these being, in the main, functions of the degree of dispersion of the rigid pigment phase.

Time forbids further elaboration of these ideas at this time. One interesting deduction from this work is that perhaps the most direct and accurate way of determining the average fineness of an unknown pigment is to take its stress-strain curve in a standard mixing, measure its area with a planimeter, and compare the energy content with that of a known pigment. The application of this method to a glue compound gave a particle diameter, which was later confirmed by direct microscopic examination after staining.

A Field for Rubber Chemists.

The physics of rubber constitutes a future field of research which has as yet been scarcely scratched. Let us hope this field may soon be cultivated by thousands of rubber chemists and rubber physicists the world over, so that in due course there may be a rich harvest of new knowledge, through which the scope and usefulness of our industry may continue to expand.

The Analysis of Babbit Metal

By H. C. BOEHMER, J. R. GORDON AND C. W. SIMMONS.

THE babbit metal referred to in this paper contained only lead, antimony and tin; and these are the only metals considered.

Oesterheld and Honegger[1] kive a method for titrating these three one after another, and it is partly because the journal quoted is not very widely circulated, and partly because of modifications that we found advantageous, and of precautions that we found necessary that we give the result of some experimenting carried out upon this method.

Owing to the complex structure of white metal alloys, and the possibility that the babbit may not be uniform, care must be taken to obtain average samples when the determinations are made. The alloy should be in very fine filings and should be very thoroughly mixed before sampling.

The method consists briefly in dissolving the alloy in sulphuric acid, precipitating out the lead as sulphate by the addition of water, and after filtering off the lead sulphate, titrating the antimony with potassium bromate. Afterwards the tin is reduced and it also is titrated with potassium bromate. The reactions involved and the preparation of the bromate solution are given towards the end of the paper.

The procedure depends on the fact that tin dissolves in hot concentrated sulphuric acid, wholly in the stannic condition instead of in the stannous as in the case when the solution is made with hydrochloric acid; while antimony dissolves entirely in the trivalent form.

In acid solution potassium bromate oxidises antimony from the trivalent condition of the quinquivalent. The end point is determined by the use of methyl orange which is bleached so soon as the antimony is all oxidised, the bleaching being an oxidising action which goes on less vigourously than the change of valency of the antimony.

In our determinations we used for a half gram of alloy, 20 cc. of concentrated sulphuric acid, and for a gram 35 cc., as we found that any less quantity of acid failed to properly dissolve the lead sulphate as it forms, and the coating thus produced protects the metal from further action. With the proportion of acid given, however, the alloy, when heated in an erlenmeyer flask loosely covered, soon dissolves on the hot plate without the escape of any very great quantity of sulphur trioxide fumes.

After cooling, we added water slowly, in order to precipitate the lead. As stated in the original paper, we found that antimony is precipitated as basic sulphate on addition of water, before the lead sulphate is all separated out, but that the addition of 5 cc. of concentrated hydrochloric acid prevented the formation of the basic salt. It is important not to add more hydrochloric acid because lead sulphate may be somewhat dissolved. About 150cc. of water should be added. It is necessary to allow the precipitate to stand at least one hour before filtering. In some way the antimony and tin present cause lead sulphate to precipitate more quickly than it otherwise would.

We filtered in a Gooch crucible with asbestos which had been treated with hydrochloric and sulphuric acid, washed the precipitate with cold water containing a little sulphuric acid, and afterwards once or twice with cold distilled water. After the precipitate was sucked as dry as possible, the crucible was placed on an inverted crucicible lid, heated slowly at first till the moisture was nearly all driven off, and then at a dull red heat for half an hour; which gave a constant weight.

The filtrate which had a volume of about 200 cc. had a couple of drops of methyl orange solution added and was then titrated with OIN potassium bromate. Oesterheld and Honegger titrated for antimony before filtering from the lead sulphate but we found that the end point was much sharper in a clear solution, and so, after one or two experiments carried out according to the original method, we employed the modification given.

Both tin and antimony are now in the oxidised condition, and for the titration of the tin it is now reduced from the stannic to the stannous condition. This may be done by zinc. Oesterheld and Honegger added to the solution an equal volume of concentrated hydrochloric acid and then, in three separate lots, nine grams of zinc; as they say a large excess is necessary in order to completely reduce the tin, and that the reduction is not complete if all the zinc is added at once. This they attribute to a coating of tin being formed on the zinc which prevents the action of the latter. Since the tin is deposited as metal, it must, of course, be redissolved. We used nine grams of zinc, but instead of addng the zinc in three lots we added all the zinc at once and the acid about five cc. at a time until 40 cc. had been added. We found that in this way the action could be better controlled. Possibly we might have found that a smaller quantity of zinc would have served the purpose with a saving of time. We, however, did not check Oestergeld and Honegger in this respect. While the reduction is going on all the air must be. expelled This is accomplished by passing into the flask a current of carbon dioxide. After reduction is complete the solution is boiled to dissolve the excess of zinc as well as the tin which had separated out. We cooled the solution rapidly by placing the flask in water, still continuing the stream of carbon dioxide. So soon as the flask was cool we immediately titrated with potassium bromate using potassium iodide and starch as indicator.

The feasibility of this method of titration depends upon the fact that potassium bromate in acid solution, completely oxidises tin from the stannous to the stannic condition before it oxidises potassium iodide to iodine but on the other hand this latter reaction takes place before antimony is oxidised from the antimonous to the antimonic condition. Hence, provided the tin is in the form of stannous salt, it is a matter of indifference in which condition the antimony is. It may be noted that in a weakly acid solution the oxidation of potassium iodide is slow, but with the concentration, which is necessary for proper solution of tin and with a crystal of potassium iodide the reaction is practically instantaneous, and with reasonable care in adding the last few drops required, there is no danger of over shooting the mash.

We found that antimony may be used for the reduction in place of zinc. Ibbotson and Brearley[2] used antimony in the iodimetric titration of tin. Kolthoff and Vander Heljde[3] found that the iodimetric titration of tin is made unreliable by the presence of large quantities of antimony.

Helvetica Chemica Acta 2, 398 (1919).

We did not find this to be the case with the bromate. This seems to be evident from the following experiment. We dissolved a quantity of tin in hydrochloric acid and made a solution containing about eight grams of tin to a litre. As this solution was exposed to the air during filtration and otherwise, it was somewhat oxidised. For complete oxidation of 25 cc. diluted to approximately 200 cc. of which 20 cc. was concentrated hydrochloric acid, 30 to 50 cc. of bromate were required. Another 25cc. diluted to about 300 cc. of which 200 cc. was hydrochloric acid was reduced by zinc according to the procedure of Oesterheld and Honegger. The bromate required, amounted to 32.40 cc. concentrated hydrochloric acid added 5 cc. at a time required 32.85 cc. of the bromate; while when the reduction was made by antimony 33.00 cc. of bromate were required.

Antimony reduces antimonic salt completely to antimonous, as we proved by first oxidising antimonous salt to antimonic by potassium bromate and then reducing by antimony. In a particular case, 6.20 cc. of bromate were required for oxidation in the first instance. The solution was then reduced by boiling with antimony, and 10.35 cc. of bromate were required for oxidation the second time. Since $6.20 \times 5/3 = 10.33$ it is evident that the reaction goes according to the equation $2\,Sb + 3\,Sb\,Cl_5 = 5\,Sb\,Cl_3$.

It is well known that metallic tin reduces antimonous chloride to antimony and it might be considered strange that tin salt can be reduced by antimony but the two reactions are distinct. The one is represented by the equation $2\,Sb + 3\,Sn\,Cl_4 = 2\,Sb\,Cl_3 + 3\,Sn\,Cl_2$ the other by the equation $2\,Sb\,Cl_3 + 3\,Sn = 2\,Sb + 3\,Sn\,Cl_2$.

Antimony does not reduce stannous chloride though it does reduce stannic. As the tin is not reduced to the metallic state and as antimony in hydrochloric acid does not produce hydrogen, it is not necessary, as when zinc is used for reduction, to get the metal into solution. As before stated, stannous chloride is readily oxidized by the air, especially when hot; the presence of antimony prevents this. When the solution is cold the inhibiting effect of antimony is lessened but so also is the tendency of the stannous chloride to oxidise.

For the titration of tin in the babbit, we added 40 cc. of concentrated hydrochloric acid and about 0.5 gram of powdered antimony, and boiled for twenty minutes. Only during cooling was there a current of carbon dioxide and the antimony was left in the flask.

In the titrations which follow, some were made by one, some by another of us; and different parts of the same titration were sometimes done by different members of the group. This largely eliminated the personal equation and in that way was good, but probably more concordant results would have been obtained if the determinations had all been carried through by the same person.

The first babbit we tried was supposed to contain tin, but J. R. Sheppard to whom the alloy had been given for analysis reported it as

Sb	13.11%	:	13.19
Pb	86.24		86.28
Sn	.06		.11

Both determinations of lead were considered as a little low as lead sulphate was thought to have run through the filter; the second tin was considered to be too high; if indeed any tin at all were present.

It was due to this unexpected result, that Prof. Waddell asked us to try out the method.

Our analysis of the same alloy were

Pb	87.21%	:	87.49%	:	87.34%
Sb	13.44		13.29		13.38

Evidently our lead was high.

We wished to test the various steps so made up a solution of antimony so that 25 cc. would contain .1056 grams. By running this solution alone we found.

Sb .1056 : .1041 : .1056 : .1042

With 25 cc. of the same solution and 25 cc. of a stannic sulphate solution containing .025 grms of tin we found

Sb .1053 : .1056 : .1048 : .1056

With the same antimony and 50 cc. of the tin solution we obtained

Sb .1056 : .1042 : .1046 : .1046

With 25 cc. of antimony solution 25 cc. of tin solution and five grams of precipated lead sulphate which was allowed to remain in the solution for some time and was then filtered off

Sb .1054 : .1050 : .1032 : .1046

As we were unable to obtain babbit on the market containing tin, we made an alloy containing in the neighbourhood of five per cent. On analysis we found

	(1)		(2)		(3)		(4)
Lead	86.36%	:	86.23%	:	86.95%	:	86.14%
Antimony	8.04		8.13		9.15		9.12
Tin	4.80		4.83		3.60		4.74

In (1) and (3) the tin was reduced by zinc; in (2) and (4) by antimony. In (1) and (2) the lead sulphate was filtered off almost immediately after precipitation and would naturally have been expected to be low. Evidently some of the antimony was carried down as basic salt and was lost. We have no explanation to offer for the high lead and low tin in (3).

Dr. Waddell has given us the following four duplicate determinations made by four of his students. These students had the benefit of our experience, but it is to be noted that they did the work in the ordinary course of their training in analysis and that they had no practice in the method. Dr. Waddell tells us that the results are more concordant than those obtained by students using other methods of analysis. Possibly in cases where the lead was low, the asbestos was at fault.

	A	B	C	D
Pb	84.60 : 85.50	84.71 : 85.00	86.08 : 86.05	85.69 : 86.10
Sb	9.36 : 9.45	10.62 : 10.56	9.12 : 9.20	9.20 : 9.38
Sn	4.90 : 4.85	4.82 : 4.99	4.12 : 4.09	4.92 : 4.86

Students C and D were as a general rule more accurate workers than A and B.

Our solution of bromate was made by dissolving 2.82 grms and making up to a litre. Compared with a carefully made OIN arsenic solution it was found to be tenth normal within experimental error. No difference was apparent whether the titration was made with the arsenic solution hot or cold.

From the equations

$K\,Br\,O_3 + 3\,Sb\,Cl_3 + 64\,Cl = 3\,Sb\,Cl_5 + K\,Br + 3\,H_2O$

$K\,Br\,O_3 + 3\,Sn\,Cl_2 + 64\,Cl = 3\,Sn\,Cl_4 + K\,Br + 3\,H_2O$

it is plain that 1 cc. of OIN bromate is equivalent to .006 grms of antimony and to .00595 grms of tin. We used our number .006 for both metals.

Summary.

1. 20 cc. of concentrated sulphuric acid is not enough for complete solution of a one gram sample.

[2] *Chemical News* 84, 167, (1901.)

[3] *Weekblad* 56, 1466, (1919.)

2. Too great stress cannot be put upon care in sampling the alloy.

3. It is preferable to filter off the lead sulphate before titrating the antimony as otherwise the end point with methyl orange is obsensed.

4. Reduction to stannous salt by means of metallic antimony instead of by zinc is to be preferred. It is quicker, no violent action occurs and excess of antimony does not need to be dissolved.

5. The method is rapid and accurate.

Queen's University, April 20, 1920.

REVIEW OF BRITISH CHEMICAL AND ALLIED TRADES.

General Comparison of Conditions Obtaining in the United Kingdom in 1913 and 1919.

In 1913 conditions were relatively stable, but war breaking out in 1914 necessitated a detailed analysis of all questions affecting chemical industry. This resulted in the Government Departments concerned (chiefly the Ministry of Munitions) gathering information which showed the inherent weaknesses of some of the pre-war methods, and caused the development of a more progressive policy. The information so collected is gradually being made available to the industry.

Further, details have become known in much fuller measure of the principles on which the German chemical industry was carried on, as in the financial contributions by German banks, the intimate study and recognition of the connection between the technical and commercial branches of trade and the benefit of combination. During the war, British chemists proved that they could take a foremost place and the chemical industry made remarkable progress in England. It is imperative that this position should be not only maintained but improved during the period of reconstruction.

Raw Materials in 1919 were still much more costly than in 1913, and additional capital was frequently necessary to enable firms to carry adequate stocks. Many manufacturers who rely upon imported raw materials have been at a serious disadvantage owing to the difficulties of transit, not only by sea, but also by rail. Certain raw materials of first rate importance—for example, phosphate rock—remained in very short supply.

Home and Export Demand.—Export trade was, in general, dull compared with 1913.

Throughout the year 1919 the home demand was, generally speaking, greater than the supply. The present demand appears to be in excess of production, stocks of many chemicals are low, and the majority of works are fully booked up for some considerable period. Certain chemical products for which there is a vitally important home demand—for example, fertilizers such as sulphate of ammonia—are also in great demand in overseas markets, prices being in many cases of secondary importance to the overseas buyer compared with the prospect of early delivery. It has therefore been found necesary to limit or prohibit the exportation of such products in order to ensure that adequate supplies may be available to meet home requirements. In the case of zinc oxide, which is in great home demand in the paint industry, home production has increased enormously since the war and the present capacity of British plants exceeds the annual pre-war consumption. Applications have, however, been received from paint manufacturers and others for permission to import Continental brands of zinc oxide, it being alleged that the United Kingdom product is of inferior color and quality.

Prices have in general fallen during the year, but not to the extent which might have been anticipated. (See table with this article.)

Production.—The industry, being of fundamental importance for the prosecution of war, has been vitally stimulated and production in certain cases has increased enormously. The outstanding example is, perhaps, sulphuric acid—the most important of all chemical products. The problem of how to utilize the abnormal quantities of sulphuric acid no longer required for war purposes has been considered by a Departmental Committee, who have recommended (Cmd. 23) that the manufacture of superphosphate of lime, by treating phosphate rock with sulphuric acid, should be largely increased in the United Kingdom. The Committee also recommended that steps should be taken to ensure the importation of adequate supplies of phosphate rock for this purpose, but unfortunately, as already mentioned, only small supplies were forthcoming in 1919. It has even been found necessary to prohibit more or less completely the exportation of superphosphate to overseas markets, in order to conserve supplies of this fertilizer for British agriculture. The production of explosives has also increased, and is dealt with in a special section of this report.

Internal Transport is in a very serious state, and the shortage of railway wagons is hindering production. Works have been unable to get their raw materials transported.

Key Industries.—These are mainly chemical, or dependent on chemical processes. The purely chemical key industries comprise the production of synthetic dyes, potassium compounds, fine chemicals and drugs, thorium nitrate, zinc oxide and lithophone. Dyes are dealt with in another section of this report and a short discussion of the potash and fine chemical industries is given below.

Working Costs in the chemical industry have increased—mainly owing to the increased labor costs. Labor demands higher wages and shorter hours, which tend to increase the cost of production. The labor problem is one of paramount importance in the chemical industry—more so than in some other industries, because, as a rule, chemical processes are continuous, and the work arduous compared, for example, with light repetition work. Working costs are also increased owing to the prevailing scarcity of coal, and to the gradual falling off in quantity of the coal available. The effect of quality is seen in furnace work where the use of inferior coal gives rise to increasing quantities of ashes, which are difficult to remove from the furnaces, and difficult to dispose of.

Chemical Plant is discussed in the section below dealing with the dye industry. It may be remarked here that there are relatively few manufacturers of such plant in this country, and standard types have not hitherto been adopted to any extent. In future the increasing influence of the engineer in the chemical industry should lead to increased standardization.

Export Difficulties and Future Outlook.

The export trade in 1919 was dull, chiefly owing to the impossibility of doing business with wide fluctuations and unsteadiness of foreign exchanges and high freights. It is found that railway companies cannot or will not collect

from the wharves, that there are practically no barges obtainable, and goods repeatedly get outshipped, with the result that orders are frequently cancelled. The future outlook depends upon foreign exchanges being stabilized (or manufacturers guaranteed against loss by some form of Government insurance), and a decided reduction in freights on the part of shipping companies to markets in which this country has to compete with American manufacturers. Transport and shipping are still almost as difficult as during the war, and certainly much more difficult than in 1914.

The effects of official control is considered below.

The prohibitions on the export of chemicals, drugs, etc., are still dictated by home requirements, as in many instances manufacture was instituted during the war, and the output is still insufficient to meet home demands. This is particularly true of dyes, but in the case of the cheaper and commoner dyes, where there is a large supply in the country, export is allowed. The policy of the Board of Trade is to remove a prohibition as soon as the home market is safe against the probability of excessive exports. In the case of some chemicals, such as cocaine, opium and explosives, the political factor weighs more than the furtherance of export trade.

Overseas Demand.—It may be stated broadly that there is a demand for chemicals of one kind and another in practically all overseas markets, but a factor which should be borne in mind in considering the probable future demand is the increasing tendency abroad to manufacture on the spot. This state of affairs has been brought about very largely owing to the stoppage or curtailment of the usual sources of supply of chemicals during the war. Production abroad has been stimulated, especially in India, Canada, Australia, South Africa and other parts of the Empire, and in addition to purely native enterprise, several United Kingdom manufacturers have opened branch factories abroad. There is, however, every indication that the overseas demand for chemical products will increase, but foreign competition will be more severe than in the past.

Competition and Organization.

The chief competitors of the United Kingdom in the chemical industry are America, Japan and Germany. America was free for a period of about three years before entering the war to organize her industry, whilst her competitors were organizing for war. But in spite of the fact that foreign competition considerably increased, it could doubtless be well met, provided exchanges and freights were adjusted to workable figures.

In a recent address, Dr. E. F. Armstrong stated that the chemical industry in the United Kingdom is characterized by the presence of a number of separate, and, generally speaking, small firms, which trade with one another, and consequently incur large expenditure on transport and related charges, whilst in Germany the industry is carried on in huge factories, in which all stages of manufacture are conducted.

Whilst there is a large measure of truth in this statement, it may be pointed out that there are many small factories in Germany, and that the number of large concerns in the United Kingdom is increasing. Even in pre-war days there were in this country powerful concerns such as the United Alkali Company, Ltd., consisting of a number of individual manufacturers under one Board of Directors, and other groups of firms, for example, alkali and soap manufacturers, who entered into working arrangements with a view to minimizing useless internal competition and overlapping. During the last few years this tendency to combination has been emphasized, especially in the dye and explosives industries.

The position in the United Kingdom, Germany and the United States of America, in the trade contest before the war has been stated in a recent issue of *Sperling's Journal*, as follows:—

"Great Britain was represented by a multitude of small, rather old-fashioned, manufacturing units, each maintaining its own agencies of sale and distribution, not at all alive to science; stubbornly individualistic both in their products and in their attitude towards other British firms in the same industry with whom they were competing far more fiercely than with the Germans or the Americans, conscious that the smallness of their installations made for inefficiency and waste, but deterred from scrapping and rebuilding them by the almost prohibitive cost, and, in the meantime, though with increasing difficulty, retaining a considerable share of the business in markets which British enterprise had been the first to exploit. Germany and the United States, on the other hand, tended more and more to be represented by huge plants, producing a limited variety of commodities in enormous quantities, employing a large body of highly-trained technologists, relying greatly on specialization and repetition work, arranging the amount and character of their output by agreement with other firms, disposing of their products through collective selling and distributing agencies; and by thus pooling their resources and organizing each industry as a whole, they were able to command ample credit, and to marshal most formidable forces against whatever point they selected for attack.

Trade Associations.—Before the war there was hardly any inclination on the part of chemical firms in this country to associate themselves together with a view to taking joint action on matters affecting the trade as a whole. During the war, however, two important associations have been formed in the chemical trade, and these bodies are discussed in turn below.

Association of British Chemical Manufacturers.—The chief objects of the Association, membership of which is confined to manufacturers, are as follows:—

(1) To promote co-operation between British chemical manufacturers, with a view to the prevention of overlapping of effort.

(2) To place before the Government the views of the Association upon matters affecting the industry.

(3) To develop technical organization and promote industrial research.

(4) To facilitate the development of new British industries and the extension of existing ones.

(5) To improve methods of education in chemistry.

(6) To finance research.

The importance of this Association is now recognized officially.

With regard to the work of the Association on behalf of export trade, it may be mentioned that the Association has published a directory of the chemical products manufactured by its members, and copies have been sent to His Majesty's Overseas Officers.

British Chemical Trade Association.—This is a more purely trade body than that previously considered, and the members are mainly chemical merchants, although

manufacturers are also admitted to, and a few have actually joined, the Association.

The objects of the Association are briefly: To promote and assist trade in chemicals, to provide for accurate sampling and analysis, to establish uniformity in commercial usages, and to promote the voluntary (but not compulsory) adoption thereof; and to promote or oppose legislative or other measures affecting the trade.

The Association allows complete freedom to its members in all their business transactions, but aims at maintaining a high standard of business morality, and hopes eventually that membership will come to be recognized as a guarantee of satisfactory status in the chemical trade.

Co-operation between Trade Associations and the Government.—As an instance of this, the case of the Sulphate of Ammonia Export Traders' Association may be cited. This Association represents the majority of the firms in the sulphate of ammonia trade, both manufacturers and merchants. In order to conserve the supplies of this fertilizer required by British farmers and prevent the home market from being stripped by the urgent overseas demand, the Board of Agriculture concluded in May, 1919, for a period of one year, an agreement with the Association whereby sulphate of ammonia is only allowed to be exported if purchased through the Association, and provided that that body guarantees that there are sufficient stocks of export. The Association, on its part, agreed to conserve a total of 200,000 tons of sulphate of ammonia for home use.

Prices of some important chemicals compared with pre-war and armistice prices:—

Name of Product.	July 31, 1914. £	s.	d.	Nov. 15, 1918. £	s.	d.	Dec. 24. 1919. £	s.	d.
Acetic acid (glacial), ton	32	0	0	—	—	—	85	0	0
Nitric acid (80° Tw.), ton	14	0	0	34	10	0	34	10	0
Sulphuric acid (pyrites 168°), ton	3	5	0	7	18	9	7	18	9
Acetone, ton	47	10	0	165	0	0	90	0	0
Ammonia (0.880), ton	25	15	0	34	0	0	33	0	0
Aniline oil (pure), lb.	0	0	5½	0	1	2	0	1	6
Arsenic (white powdered), ton	6	0	0	90	0	0	66	0	0
Bleaching powder (35%) ton	5	7	6	15	0	0	17	0	0
Benzol 90's (naked), gal.	0	0	10	0	1	0½	0	2	0½
Carbolic acid (crystallized 40°), lb.	0	0	3½	0	1	10	0	0	10½
Copper sulphate, ton	20	2	6	63	0	0	40	0	0
Iodine, oz.	0	0	9	0	0	10½	0	1	0
Iron sulphate (copper as delivered), ton	1	6	0	12	10	0	4	5	0
Lead acetate (brown), ton	24	0	0	145	0	0	67	0	0
Epsom salts (coml), ton	4	0	0	14	0	0	12	0	0
Methylated spirit (64° industrial), gal.	0	2	2	0	8	5	0	5	7
Potassium nitrate (refined), ton	25	10	0	66	0	0	55	0	0
Borax (crystals), ton	17	0	0	42	0	0	39	0	0
Sodium nitrate (100%), ton	21	5	0	75	0	0	62	0	0
Sodium sulphate (Glaubers salt), ton	2	7	6	3	10	0	4	0	0
Tin crystals, lb.	0	0	10½	0	2	6	0	2	2
Zinc chloride (solution 102° Tw.), ton	6	15	0	24	10	0	23	0	0
Zinc sulphate (crystal), ton	6	15	0	24	0	0	21	0	0
Caustic soda (77/78%), ton	12	5	0	27	10	0	24	10	0

Potash.

This industry was a German monopoly before the war, and one which the United Kingdom and her Allies attempted to break down by the recovery of potash from native sources. Quite apart from this consideration, the process in vogue in the United Kingdom for recovering potash from blast-furnace dust will require structural changes to be made in existing plants throughout the country in order to stand any chance of economic success, and it will be necessary to convince the owners of such plants that these alterations are really worth while.

Fine Chemicals and Synthetic Drugs.

Germany held a pre-eminent position in this industry before the war owing to her predominance in the dye industry; it is nevertheless incorrect to suppose that this country was entirely dependent upon Germany for all pharmaceutical chemicals. Since the outbreak of war the fine chemical industry has grown substantially in the United Kingdom, and synthetic products, often of a high degree of complexity, and equal or even superior in purity to the pre-war German products, are now being produced in increasing quantities. Such products comprise synthetic drugs, synthetic perfumes, photographic developers and analytical reagents. The fine chemical industry is, however, not yet firmly established, and the possibility of its continued economic existence in the face of future German competition is at present uncertain. The future of the fine chemical industry is closely dependent upon the dye industry, and if the latter can be successfully established, there should be no fears as to the former.—Prepared by British Trade Commissioners in Ontario, from information furnished by the Department of Overseas Trade of the British Government.

(To be Continued in the July Issue.)

SIXTH NATIONAL CHEMICAL EXPOSITION.

The 1920 Annual, which is the Sixth National Exposition of Chemical Industries returns to the Grand Central Palace in New York, where it will be given during the week September 20th to 25th inclusive.

The Exposition this year will be more pretentious than ever; in fact, it will be the largest distinctly industrial Exposition ever held, and will surpass its own predecessors by one-third.

There are now engaged for the coming Exposition 358 exhibitors which is more than in the last Exposition in Chicago. The growth of this Exposition is remarkable and in a way indicates the growth and development of the chemical industries in America. In 1915 the first Exposition was composed of 83 exhibitors, the second increased to 188, the third to 288, the fourth to 334, and the fifth in which the available space was much restricted and exhibitors were held to a minimum to admit 351 exhibitors, the present number of 358 the managers tell us cannot be much increased in number because of the limited amount of space remaining. Another floor had been added giving four floors of the Grand Central Palace each of which covers a whole square city block so that exhibitors could secure increased space and not suffer the cramping felt in the last Exposition.

Quite as remarkable as the growth of the Exposition itself is the increased attendance and interest that is shown in the exhibits. To the first Exposition there came 63,000 visitors, to the second there came 80,000, and this has steadily increased till at the last there was in excess of 111,000. One who has watched the development of the Exposition and the interest of the visitors can testify to the great improvement in character of representatives the manufacturers have in attendance with their exhibits and the wholesouled way in which they give valuable information and discuss the details of the nature of the many materials on exhibit. On the other hand the exhibitor profits doubly from this open contact with the men from the field for often the suggestions they make

are immeasurably valuable and the orders they place equally as welcome. The visitors, too, have undergone a change—one of education—the first Exposition brought forth a small following of the idly curious, but in subsequent Expositions a study of those attending has developed the fact that the interest even of the general public is more vital. These are the people whose minds and confidence are being trained now for the future development of the chemical industries: those, in which the exhibitor is primarily interested for the business he must do, come in large numbers, and, from the preparations being made, an unusually large attendance from all over the world is expected.

This year the Exposition will have three special sections, one the Electric Furnace Section, another the Fuel Economy Section, and the third a Materials Handling Section, the two latter are new sections: the first will as its name implies be one of electric furnace exhibits; the Fuel Economy Section will consist of exhibits of machinery and apparatus, furnaces, producers, stokers and all devices for the economic utilization of more efficient combustion of fuel. The possible exhaustion of our fuel reserves in the not far distant future and the present hight cost of fuel makes this section one of much interest to all industrial plants. The Materials Handling Section will be a series of exhibits of machinery and equipment for the handling of material such as: conveying, transporting, elevating, included in this will be be weighing, measuring and power transmission equipment. So important have these mechanical features become for all industrial plants, due to the shortage and high wage for man-power, that an unusual interest is expected in this new section.

The programme for the Exposition will have sessions on subjects, the phases of which will be developed in the exhibits of these latter two sections. There will be sessions on chemical engineering, for which an elaborate programme is planned. Motion pictures, which will have a keen interest for technical men, will form part of the programme, and there will be popular public addresses as well.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

The general tone of the chemical market during the month has been one of steadiness, especially in the heavy chemicals. With the exception of a few of the finer chemicals and pharmaceuticals, there has been but slight change in prices. Magnesium sulphate has advanced again, and the natural Canadian salt is well ordered for some months in advance. Unquestionably the Canadian natural Epsom is meeting with decided favor in the trade. The increasing demand for Canadian Epsom has boosted the price from $65 to $85 per ton in car lots within the past 30 days. Single tons are quoted at from $90 to $100. American whiting has jumped $5 per ton and is difficult to obtain even at the advanced quotation. English whiting is quoted in Toronto at $40 per ton. Caustic soda is still short in supply, the difficulty of obtaining coal and lime being the chief cause of the shortage here, while the coal shortage, together with congested railway facilities keeps the price up in the United States. So far as business in general goes, the volume keeps up well. It would appear that prices have become fairly well stabilized for a while now, though shortage in some lines will be bound to occur, causing some advances.

Oils.

Crude Oils.—The situation in the crude oil market is one that is attracting a good deal of attention. Prices have advanced $1.10 per gallon since January 1, 1920, on Pennsylvania crude, and higher quotations are in order. The demand so far as crude oil is concerned is truly greater than the supply. Reserve stocks of companies are being drawn upon, and no more oil is being produced than last year. The need for greater development work on crude oil mining is most necessary. The demand is steadily increasing. The higher price of crude is naturally reflected in the increases on quotations of refined products. The following quotations on Pennsylvania crude which prevailed during the past three years show at a glance what startling advances have been made: January 1, 1917, $2.85 per gallon; January 1, 1918, $3.75 per gallon: January 1, 1919, $3.75 per gallon; January 1, 1920, $5; April 1, 1920, $6.10, at which figure it is still quoted. Mid. Continent crude to-day quoted at $3.50, was sold at $1.40 January 1, 1917.

Linseed.—The quotation of $2.50 per gallon at Toronto and Montreal hardly anticipates the price of the seed at Winnipeg, which would normally call for a higher price, but considerable English linseed oil has come into the Canadian market recently via Montreal, and sold at a lower price than the Canadian make. The English grade is not considered as good as the domestic production.

Turpentine.—Turpentine prices show an easing off for the first time this year, and the prospects are for lower prices, due to better transportation facilities from the South. The high price at which turpentine has been selling during the past six months has been due mostly to the increased wages demanded by the negro laborers employed by the industry, and it is impossible for the product to ever sell again at figures quoted before the war, though, as said before, the recent betterment of transportation facilities will eliminate that factor that aggravated the price, and consequently somewhat lower quotations may be expected.

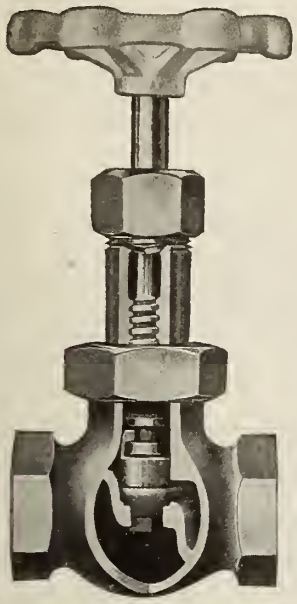
Steel.—The serious transportation situation in the United States, causing congestion of material in plant yards, together with the coal shortage, are the chief causes of the shortage in steel plates and sheets in Canada. Sheet mills and finishing plants have been thrown at least two months behind in shipments. Tin-plate is very scarce, and the canning industries may suffer considerably for lack of the tin-plate for cans.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Alum, Ammonia, lump and ground	100 Lbs.	.. — 5.00
Ammonium Bromide	Lb.	.. — 1.00
Aluminium Sulphate, high grade, bags	100 Lbs.	5.75— 6.00
Ammonia, Aqua 26	Lb.	.10½— .16
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.18— .25
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	38.00—40.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00



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Sales Agent: A. O. Thorne & Co., 18 Mail Building, Toronto, Ont. Head Office, Kitchener, Ont.

Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	.. —40.00
Camphor Monobromate	Lb.	.. — 5.75
Carbon Bisulphide, in drums	100 Lb.	.12— .13
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, bbl.	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. —.02½
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.11¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.. — .17
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .25
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.05½—.06½
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—100.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	85.00—90.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.15
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — ..
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash). Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — 1.35
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.45— .55
Sodium Bisulphite, powder	Lb.	.. —.08½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.00— 2.25
	Per Cwt. in Car Lots	.. — 1.70
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.. —.08¼
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	30.00—35.00
Whiting	Per Ton	25.00—30.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .70
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.06¼— .07
Acetic acid, refined	Lb.	.. — .21
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.25— 1.35
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.50— .60
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.. — .85
Formaldehyde	Lb.	.65— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .28
Hexamethylenetetramine		.. — 2.50
Oxalic Acid	Lb.	.45— .55
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.25
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	.. — 3.00
Quinine	Oz.	.90— 1.00
Saccharin	Lb.	5.00— 5.50
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .42
Tartaric Acid, crystals or powdered	Lb.	1.10— 1.25

Tanning Materials.

Archill, extract	Lb.	.. — .30
Fustic Crystals, extract	Lb.	.. — .15
Hematine Crystals, extract	Lb.	.. — .21
Logwood Crystals, extract	Lb.	.. — .50
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .12
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Sumac, extract, No. 2	Lb.	.. —.10½
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.32— .40
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Fluorspar, ground	Ton	.. —30.00
Fluorspar, ground	Lb.	.. — .06
Fluorspar, lump	Lb.	.. — .05
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.11½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.35— .40
Platinum, pure	Oz.	.. —170.00
Silver, bar	Per Troy Oz.	.. — .85
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .73
Zinc, sheets	Lb.	.. — .22

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .38
Motor Gasoline (service stations)	Gal.	.. — .41
Lighting Gasoline	Gal.	.. — .43
Naphtha	Gal.	.. — .37
Coal Oil	Gal.	.. —.27½
Fuel Oil	Gal.	.. — .16
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots	(Imp.) Gal.	2.75— 3.00
Rosin, Grade G, in 280 bbl. lots		.. —20.00
Rosin, Grade W.W., in 280 bbl. lots		.. —22.00

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .32
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	.. — 2.52
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	.. — 2.53
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .21
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½

Arabic, white sorts	Lb.	.40
Arabic, powdered, No. 1	Lb.	.40
Arabic, powdered, No. 2	Lb.	.39

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Steamed Bone Meal	Per Ton	45.00
Pure Ground Blood, per unit of Ammonia		7.50
Animal Tankage, per unit of Ammonia		7.25
Animal Tankage, per unit of Bone Phosphate of lime		.10

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TP1663-A—350 H.P. Erie City vertical water tube boiler, Butt strap double riveted. Heating surface 3,741 sq. ft. Grates 8 x 7 ft. Travelers Insurance Co. allows 125 lb. pressure.

CG338-A—Three 400 H.P. B. & W. boilers. Heating surface, 4,000 sq. ft. Drums double riveted, lap joint. American underfeed stokers. Pressure 160 lb.

CG272-A—Two 400 H.P. Wickes water tube boilers, A. S. M. E. code, 150 lb. pressure.

CG294—500 H.P. Sterling boiler, class F, No. 30, drums lap riveted. Hartford inspection, 150 lbs.

CG379—Four 600 H.P. new B. & W. boilers, 200 lb. pressure. A. S. M. E. code, provided with Detroit stokers.

WASTE HEAT BOILERS.

JK3009—Four 150 H.P. Waste Heat Erie City return tubular boilers, 72 in. diam., 18 ft. long, 150 lb. pressure. No grates or lower fronts. One new, others slightly used. Intended to be fired by waste gas from black ash incinerators. Usual fittings.

HEATERS.

JK3016—Five new Paterson hot water heaters. 1,600 sq. ft. in seamless brass tubes. (4,000 H.P. each.) Imparting to water 3,000,000 Btu. per hour with steam at 212 deg. F.

CG13-J—Four 870 H.P. Paterson feed water heaters, 21 in. diam., 6 ft. 9 in. long. With 254 ¾-in. tubes, 5 ft. 9 in. long. Heating surface 290 sq. ft.

CG13-I—Four 1,350 H.P. Paterson feed water heaters, 28 in. diam., 7 ft. long. With 294 1-in. tubes, 6 ft. long. Heating surface 450 sq. ft.

STEAM ENGINES.

JK3015—Four new 350 H.P. Allis-Chalmers Co. Corliss engines, 18 x 36 in., 125 rpm., 140 lb. steam pressure, 1½ lb. gauge back pressure. Heavy duty type. Flywheel 11 ft. diam., 32 in. face, 6 in. steam inlet. Complete Robertson-Phenix lubricating system.

ENGINE GENERATOR SETS DC.

CG376-A—Two 100 K.W. 120 Volt General Electric Multipole Generator, direct conn. to a Harrisburg Engine, 250 rpm.

CG315—400 H.P. 21 x 22 in. Skinner Unaflow engine, operating at 150 lb. pressure, 200 rpm., direct conn. to a 150 KW. 500 Volt, DC, Crocker-Wheeler Generator on one side, and to a 75 KW, 125 Volt, DC, Crocker-Wheeler Generator on opposite side.

CG289—1,200 KW, Crocker-Wheeler compound wound generator, 250 Volt, direct conn. to a 28 and 56 x 48 in. stroke, Watts-Campbell Corliss cross compound engine. Complete with Blake & Knowles jet condenser and pumping equipment.

TURBO GENERATORS SETS—DC.

CG287—100 KW, 125 Volt, DC, General Electric Generator, direct conn. to Curtis turbine, 150 lb., condensing. With Le Blanc jet condenser and pumping equipment.

TP887-A—Two 100 KW Crocker-Wheeler Generators, 250 Volt, mounted on a common bed plate and direct conn. through a common shaft to a Terry steam turbine, 2 stage, 150 lb. pressure, condensing. With Worthington surface condenser, pumping equipment and spray pond.

CG3-E—200 KW, 250 Volt, General Electric Generator, gear driven by a 2 stage, non-condensing Curtis turbine.

CG54-K—300 KW, 125 volt, DC Allis Chalmers Generator, mounted on common bed plate to a Kerr mixed pressure turbine.

TURBO GENERATOR SETS—AC.

CG299—15 KW, 3 phase, 60 cycle, 11,000 volt General Electric Generator, direct conn. to multi-stage Curtis turbine. Operating condensing, non-condensing equipment included.

CG311-E—150 KVA (120 KW) Westinghouse Generator, 3 phase, 60 cycle, 2,300 Volt, 600 rpm, direct conn. to a 220 H.P. horizontal double runner closed type Leffel water turbine. Operating under a 45 ft. head with 40 in. intake and 17 in. runners. Complete with exciter, switchboard and instruments.

CG331-A—500 KW, 3 phase, 60 cycle, 2,300 volt, Geneneral Electric Generator direct conn. to curtis vertical single stage turbine now operating non-condensing. By addition of runner in the last stage and the supplying of necessary condenser equipment, turbine can be changed to operate condensing.

TP860-D—500 KW, 3 phase, 60 cycle generator, 4,150/2,400 Y between phase and neutral, direct conn. to horizontal water wheel, 200 rpm.

CG400—Two 500 KW, 3 phase, 25 cycle, 6,600 volt Westinghouse Generators, driven through common shaft by a Parsons multi-stage reaction type turbine. Operating condensing under 175 lb. pressure at throttle.

TP860-E—700 KW, 3 phase, 60 cycle generator, 4,150/2,400 Y between phase and neutral, direct conn. to horizontal water wheel, 200 rpm.

CG13—750 KW Allis-Chalmers Generator, 3 phase, 60 cycle, 600 volt, mounted on common bed plate to a 1,000 H.P. De Laval turbine operating at 175 lb. steam and 10 lb. back pressure.

Continued on next page.

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CG397-C—2,500 KW, 3 phase, 60 cycle, 5,500 volt, Westinghouse Generator, direct conn. to Parsons turbine, complete with Le Blanc condenser and motor driven auxiliaries. Unit operates under 225 lb. pressure at 100 to 150 deg. F, superheat. Can be reconnected to 2,300 volt.

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TP939—Triple effect Yaryan Evaparator, steel shells 44 in. diam. About 400 sq. ft. heating surface in 8 coils, 3 in. steel tubes. Complete with catch-alls, piping and steel columns. No condensers or pumps included.

TP1677-A—Two triple effect Zaremba vacuum evaporators, each consisting of 2 cast iron bodies 84 in. i.d., one with cone bottom and one with domed bottom; one steel plate body 84 in. i.d. with domed bottom. Each unit complete with vapor lines, catch-alls, barometric condensers and full pumping equipment, also structural supports.

TP1677-B—Triple effect Stokes Vacuum Evaporator, consisting of three 84 in. i.d. ⅜ in. steel plate bodies with cast iron bottoms; complete with separator for each body, one barometric condenser and full pumping equipment.

JK3004—Triple effect Zaremba Evaporator, brand new. Each effect with cast iron and ⅜ in. steel body 10 ft. diam., 16 ft. cylindrical height. Heating surface 3,000 sq. ft. in 880 spellerized horizontal steel tubes. Intended for black liquor. With two Am. Marsh tank pumps and one condensate pump. Liquor lines and automatic controllers.

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JK3005-A—Central counter current barometric condenser, of steel, intended for the triple and quadruple effect Zaremba evaporators JK3004 and 5. Shell 54 in. diam., 11 ft. 9 in. cyl. height. Laidlaw feather valve dry vacuum pump.

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JK3006—Four new welded steel digesters, Continental Iron Works make, 1,500 cu. ft. capacity each, 8 ft. diam., 27 ft. high. Shell of ¾ in. soft steel plate, domed heads 13/16 in. plate, 23½ in. charging manhole and 5 in. pipe flange in top; 10 in. discharge and 5 in. pipe flange in bottom. Test pressure 165 lb., working pressure 110 lb., sq. in. Blueprint.

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JK3003—Ten Mammoth Jr. Jordan Beater Engines, Noble & Wood make. Capacity 30 tons per 24 hours; 5 are new, 5 are used. Each engine provided with 258 steel bars, 41 long and 41 short, 3 16 in. blocks and oak filler.

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JK3012—Twenty new vertical G. E. induction motors, rated at 40 H.P. with 3 minute intermittent service (as with mixers). Speed full load, 1,170 rpm. 440 volt, 3 phase, 60 cycles, 51 amperes. Each complete with starting panel, rheostat and oil switch.

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JK3013—Five Alcohol rectifying units, each for 200 gal. per hour from 50 per cent. to 190 proof. Steel kettles 10 ft. diam., 24 ft. high. Copper columns 54 in. diam., 16 ft. 6 in. high.

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JK3008—Ten Stands De La Vergne atmospheric ammonia condensers, each twelve 2 in. pipes high, 20 ft. long. Without headers.

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TP1670-A—Eleven new 15,000 gal. (480 bbl.) hor. steel tanks, 8 ft. diam., 40 ft. long. Shell 5/16 in. Dished and flgd. heads ⅜ in.

NT4034—Four 17,100 gal. (545 bbl.) ver. steel tanks, 9 ft. diam., 36 ft. high.

CG405-A—Six 17,625 gal. (560 bbl.) hor. galv. steel tanks, 10 ft. diam., 30 ft. long. Shell 5/16 in.; dished heads ⅜ in. With manholes and standard nozzles.

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CG351—225,900 gal. (6,860 bbl.) ver. steel tank, 35 ft. diam., 30 ft. high.

CG374—Four 372,000 gal. (11,800 bbl.) ver. steel tanks, 50 ft. diam., 25 ft. 4½ in. high.

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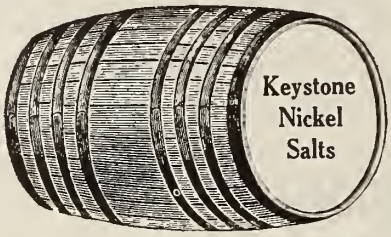

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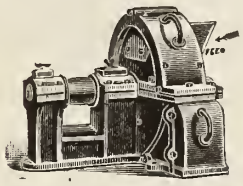

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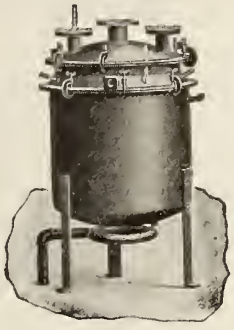

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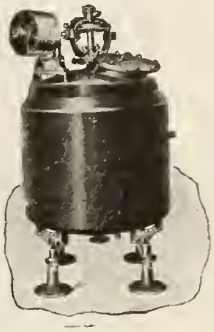

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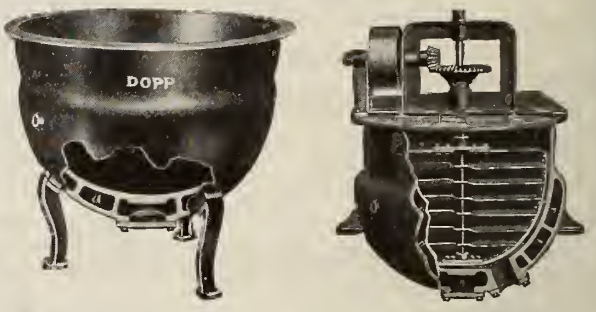

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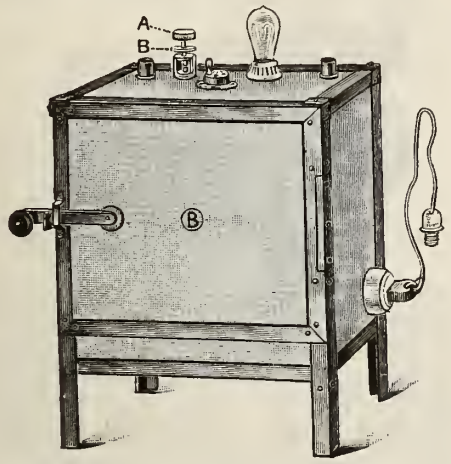

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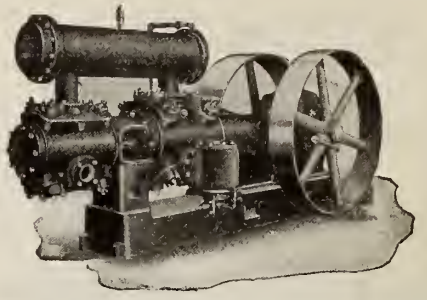

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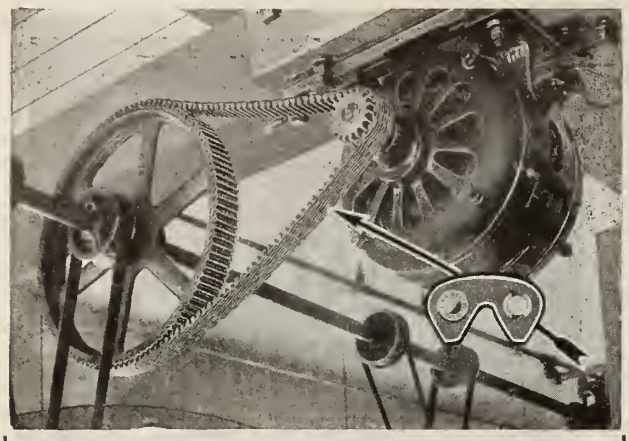

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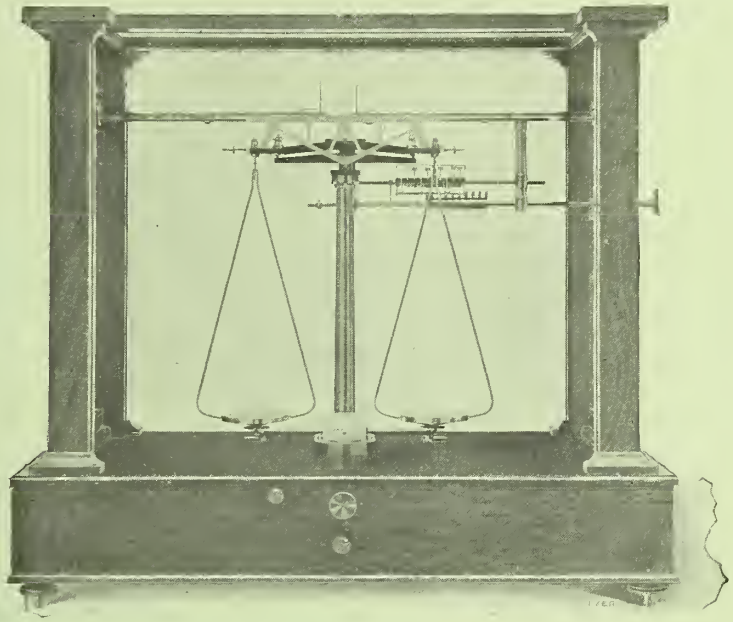

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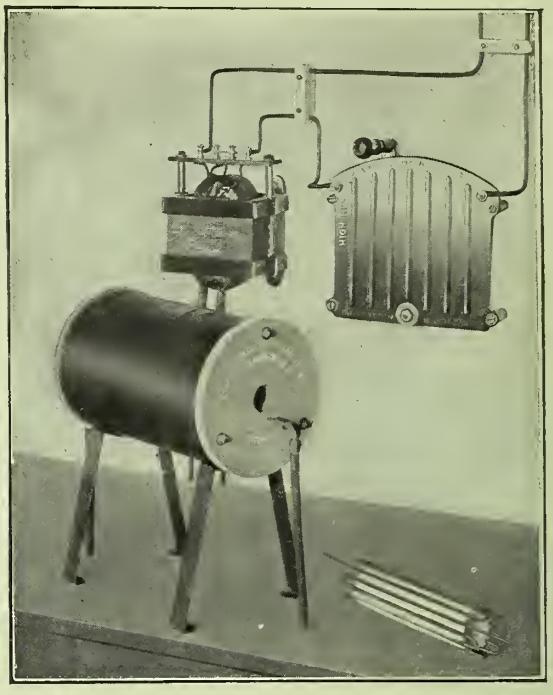

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These furnaces are furnished complete with transformer and rheostat. The return coils, of heavy wire, are economical in the use of current, have large heating capacity, last almost indefinitely, and are easily repaired in case of damage.

The furnaces are recommended for laboratory work, also for numerous heat-treating shop operations, such as preheating of High Speed Steel; Hardening and Annealing of High Carbon Steel Tools; Enameling of Jewelry, including Watch Dials; fusing of Bifocal Lenses; Annealing of Commercial Glassware, etc.

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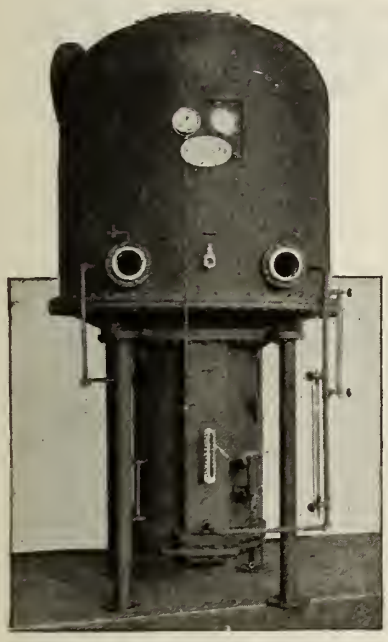

Evaporator, Vertical Type "Buflovak" Rapid Circulation

Mechanical Strength with ample thickness of metal for all important parts.

Uniform Circulation of the boiling liquid so as to prevent coating of tubes.

Proper Proportions of the evaporator so as to avoid losses by entrainment and foaming.

Proper Distribution of steam over the whole heating surface.
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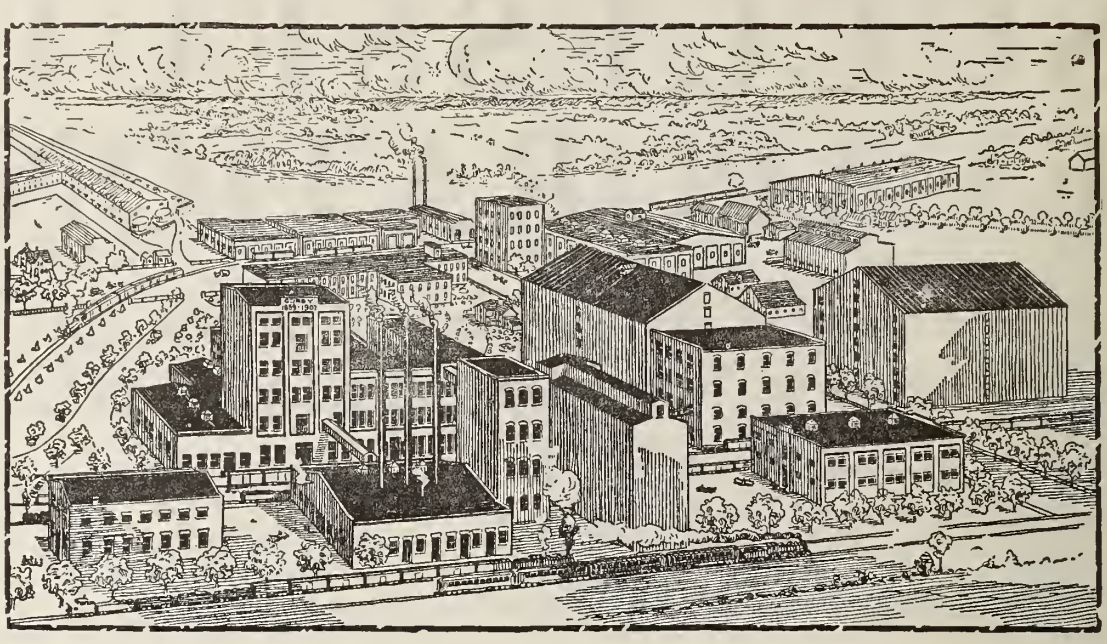

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Canadian Industrial Alcohol Co.

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ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF LANDS, FORESTS & MINES
BUREAU OF MINES

Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Summary of Mineral Statistics, 1919.

Product.		Quantity.		Value.	
Metallic:		1918.	1919.	1918.	1919.
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, holow building		.....	.....	195,588	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,726
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc.		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	80,308,972	57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,532,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

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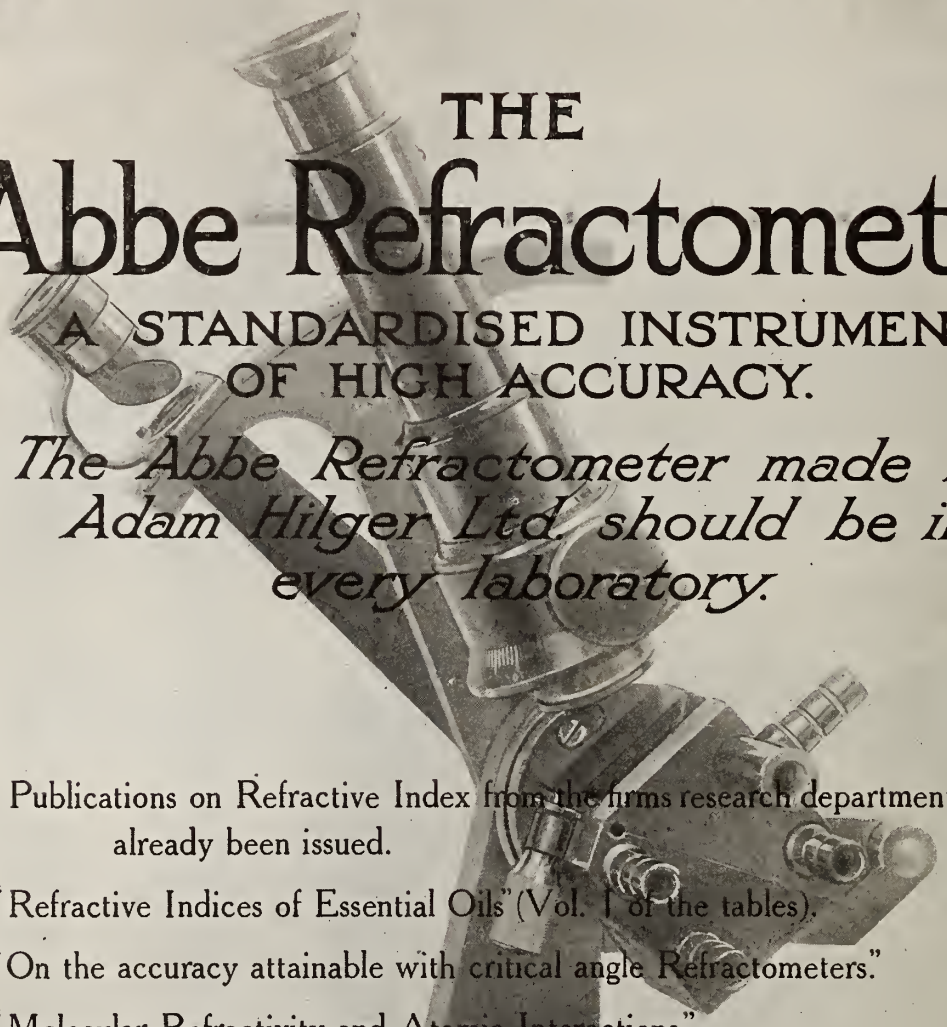

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Publications on Refractive Index from the firms research department have already been issued.

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"On the accuracy attainable with critical angle Refractometers."

"Molecular Refractivity and Atomic Interactions."

"On the Dispersion of Diamond."

"Instructions for the use of the Abbe Refractometer" (with bibliography, description, and notes on its use in Sugar Refining).

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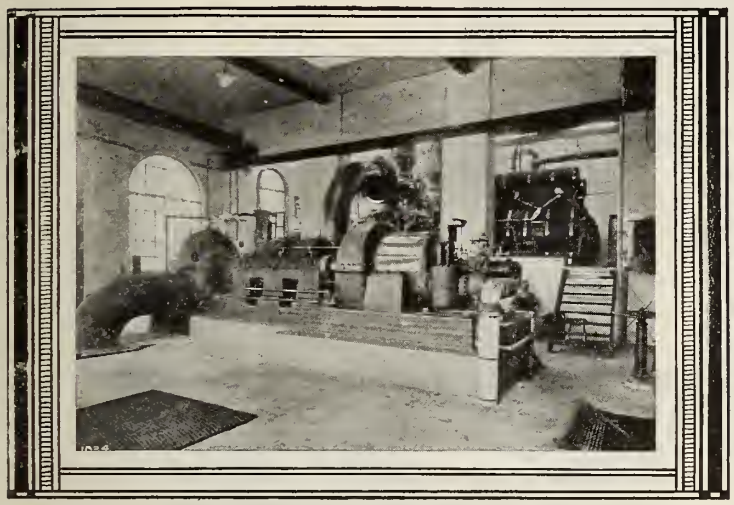
INCo Monel metal

in a record-breaking pumping station



Brake h. p. of Turbine	1600
Speed of Turbine r. p. m.	3600
Ratio of Gear	6 to 1
Capacity per 24 hours	30,000,000 Imp. gals.
Head	210 ft.
Pressure	140 lbs.
Superheat	100° F.

THE above pump—a DeLaval steam turbine centrifugal, installed by E. Laurie Company for the Low Level Pumping Station of the City of Montreal—holds the highest record of duty for any plant of this type yet installed.

The duty calculated on the basis of work delivered by the pump to the water between the suction and discharge nozzles is 134,600,000 ft. lb. per million B. t. u.

Because of its great resistance to the erosive action of superheat Monel Metal was used for the buckets in this turbine. In fact, the superiority of Monel Metal has led the DeLaval Steam Turbine Company, Ltd., which has developed an international reputation for water works installations, to use it for buckets in all of their turbines.

The name *Monel* is given to a line of metal products produced by the International Nickel Company from a natural nickel alloy—67% nickel, 28% copper, and 5% other metals. These products include Monel blocks, Monel rods, Monel castings, Monel sheets, Monel wire, Monel strip stock, etc.

Monel Metal resists alkalies, high heats, most acids, and corrosion, abrasion and the erosive action of hot gases. It can be forged, cast, machined, brazed and welded.

If you desire any further information about Monel Metal, our Technical Department is at your service.

The International Nickel Company of Canada, Limited

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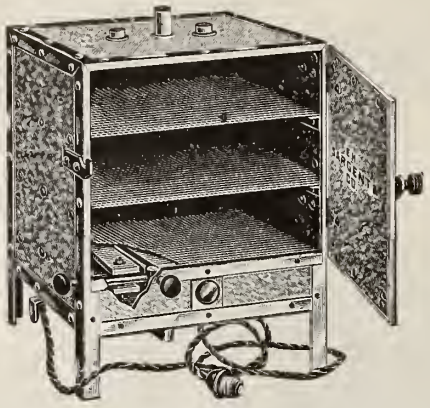

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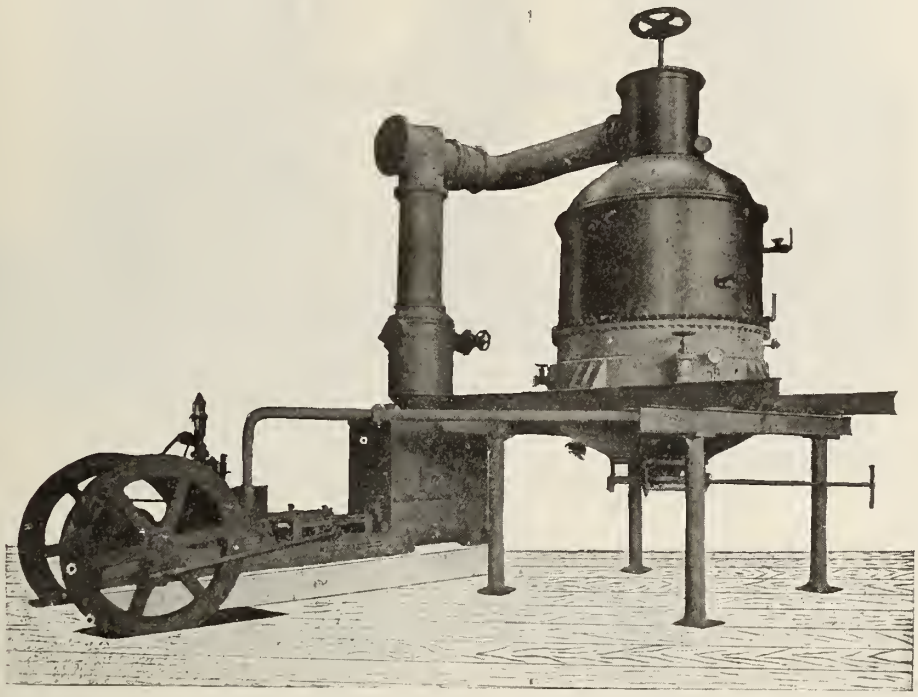

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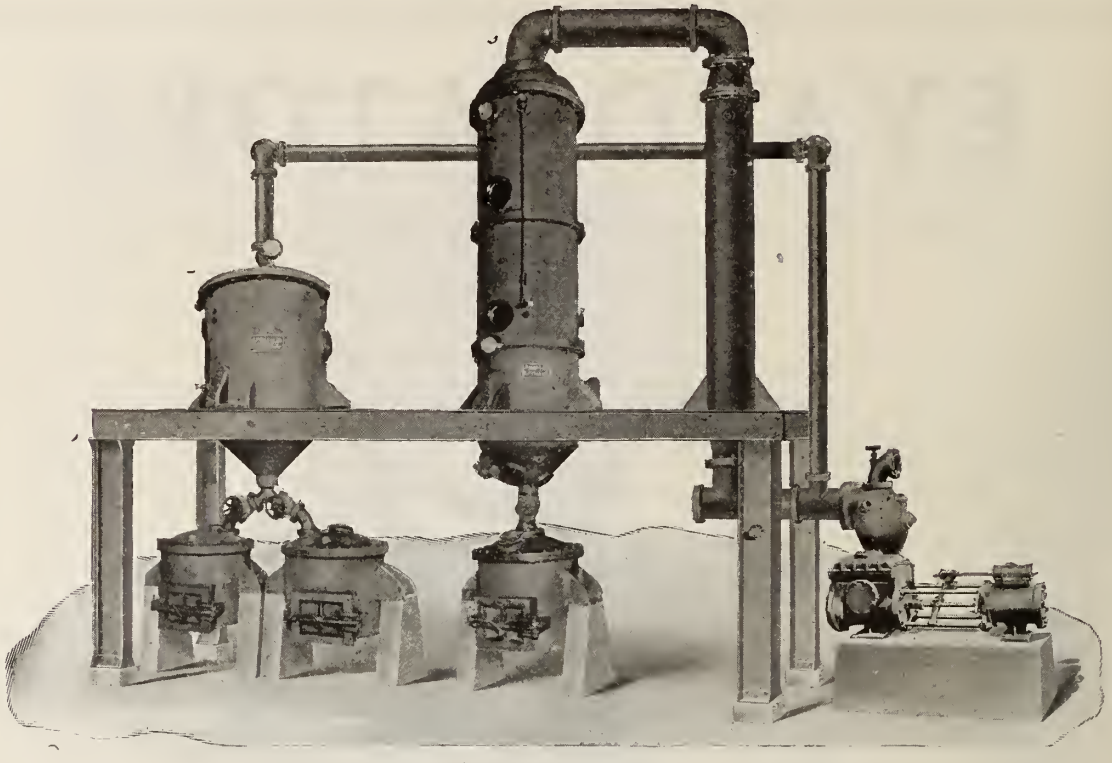

The Value of an Evaporator

cannot be measured by its initial cost, for its real value to you can only be determined by the efficiency with which it handles your solution or the amount of money it makes for you by making possible the utilization of waste products.

Devine Vacuum Evaporators are designed and constructed with this end in view, namely; efficient and long-lived service and economy of operation.

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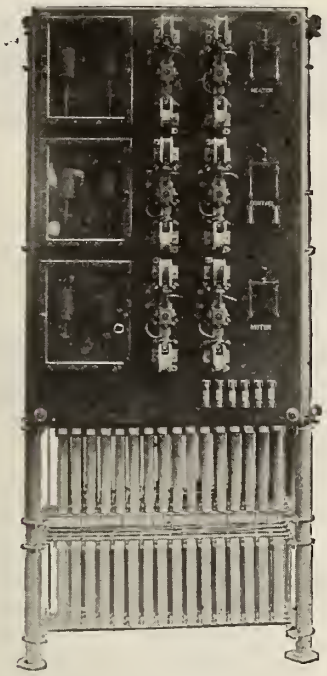

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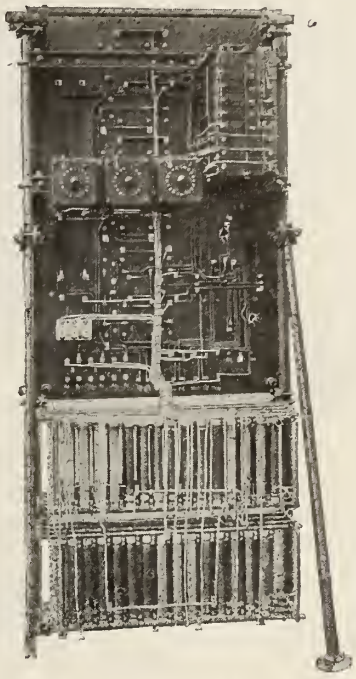

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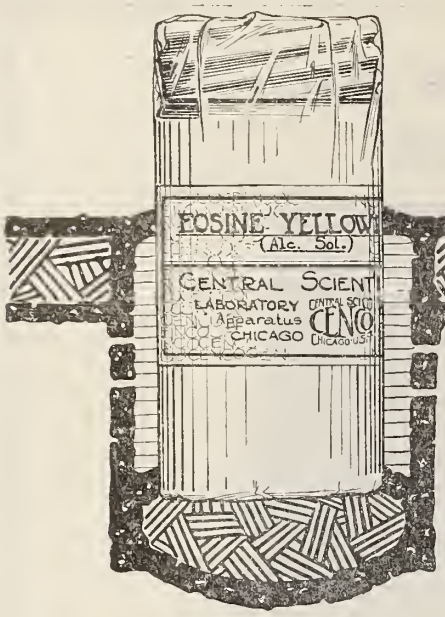

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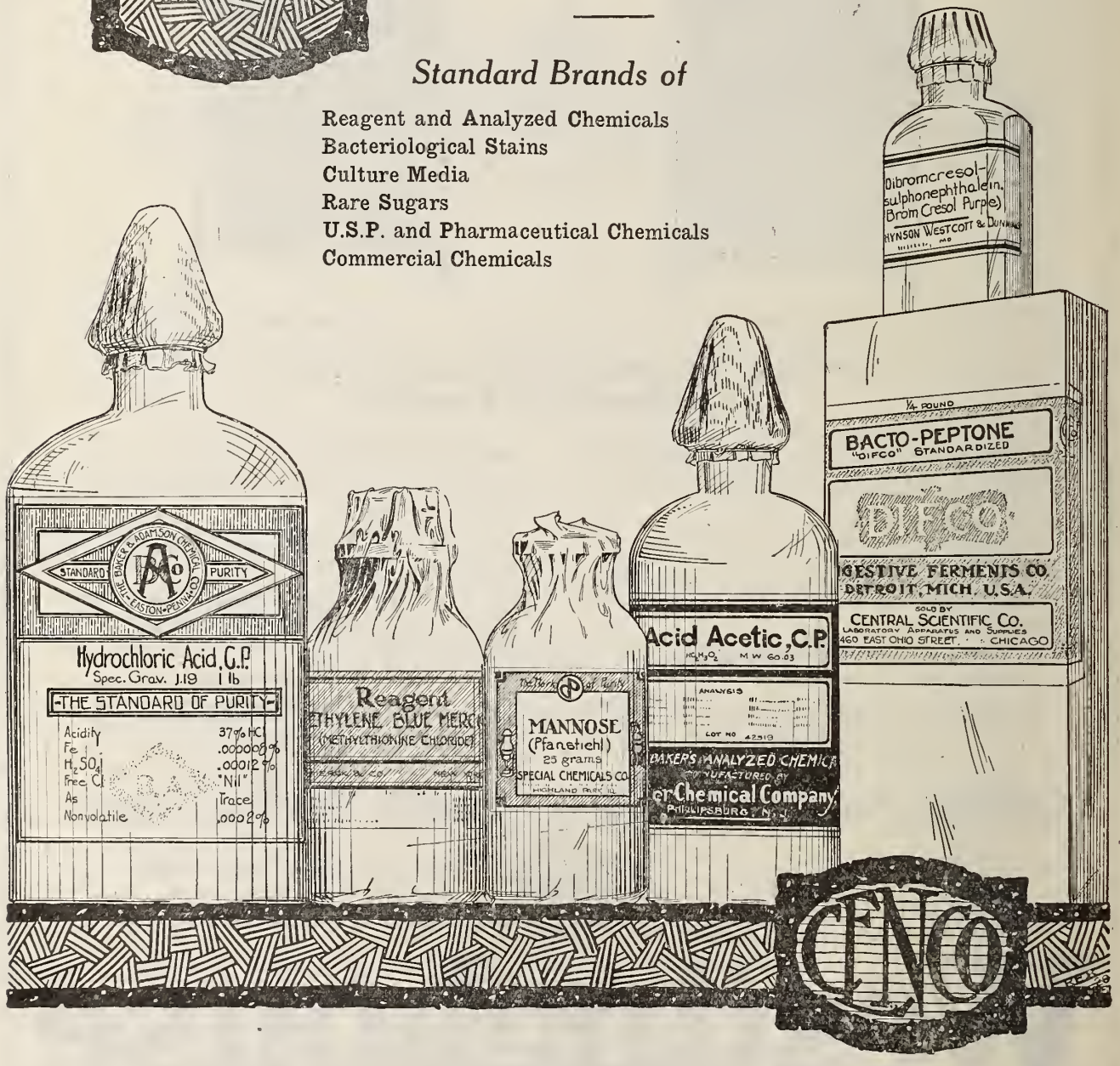

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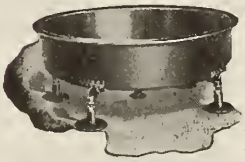

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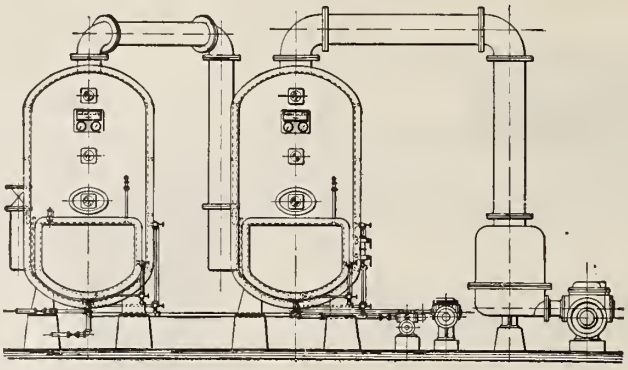

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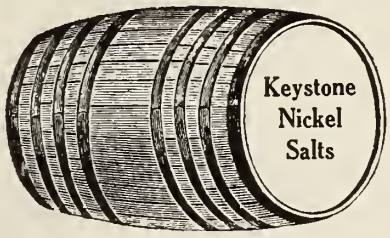

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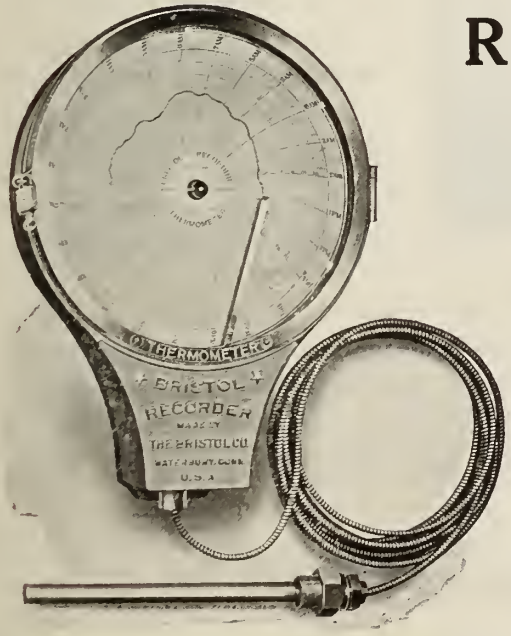

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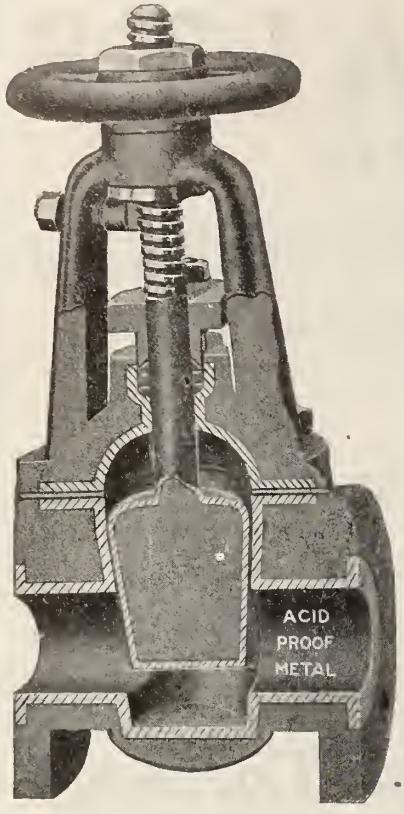

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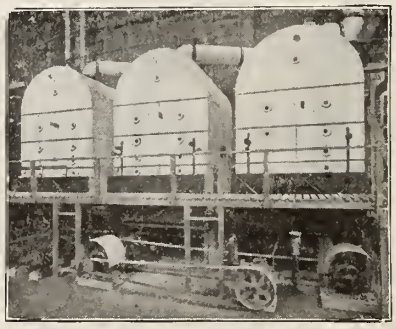

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CANADIAN
CHEMICAL JOURNAL
A Canadian Journal devoted to Metallurgy
Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 TORONTO, JULY, 1920 No. 7

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Address all communications to The Canadian Chemical Journal, 72 Queen Street West, Toronto, Canada. Telephone, Main 7399.

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EDITORIALS

THE FIELD FOR CHEMISTS.

THERE are those who express a certain fear that the recent large increase in the number of students taking courses in chemistry and chemical engineering will result in discouragement to some, due to lack of openings in industrial work. This is not found to be the case. There are certain tendencies at work which bid fair to revolutionize the field for chemists.

At one time, teaching offered the only outlet. American universities and schools, as well as Canadian, have since been robbed of their teachers of chemistry by industries. A resetting of conditions of pay and the development of technical schools should make many fair opportunities in educational work. We must have the technical schools in particular, and the financial inducements will probably not be lacking.

In the industries the field is broadening. There are probably more undergraduates employed this summer in work of some value to their chemical experience than was ever the case before. Some companies are employing as high as a dozen of these men. The field for chemists lies in new lines. In many industries the so-called practical man, whose ability and experience, in spite of his narrow qualifications, has placed him, after a hard struggle, in the position of superintendent, is on the decline. Chemists may become superintendents, and higher, following a great discovery that a technical university training does not destroy the ability of any man to grasp business essentials and guide the work of others. The laboratory alone has gone as an ideal for many chemists. Either success by the research route or through the application of chemical economics to business is the driving-force to-day, and we believe the modern chemist will not be denied.

Both in England and America chemists are being used as salesmen and purchasing agents, and an entirely new conception of the training of the chemist and what it may lead to is growing. Its broad application should be grasped by the younger men. It means new opportunities to mould national affairs and business along truly economic lines. If a chemist can utilize a waste product, why not make him a director, guiding the business of the main product? Where the experiment has been tried and a good chemist trained for the larger field the results show well. First, then, the training must be the best. We must produce good broad chemists, who are public men of affairs and leaders. Having done this, the same everlasting attention to detail, the same capacity for new ideas and thinking all around the problem, applied to the general affairs of manufacturing and industry, coupled with a sense of fundamental knowledge, should make the path to success in executive work easy. The properly trained chemist should leave university with as well balanced qualifications for general success, outside a special field, as those possessed by anyone else.

WELCOMING AMERICAN CHEMICAL ENGINEERS.

IT is gratifying indeed to note the increasing interest shown by foreign capital in Canadian possibilities. Those who deal in land see only a world gradually closing in on the remaining unsettled portions, and for Canada they see a wave of land-seekers from other countries. Statistics relating to population and prices fully warrant these conclusions. Those who see only the forest wealth, tell about the world-wide decrease and the demands that must be met from Canadian reserves. Stocks show every evidence of these movements. It is the same story in connection with much of our mineral wealth.

Canada has always had visitors, but we doubt if there were ever quite so many who were anxious to have first-hand knowledge about Canadian resources. The war effort still remains Canada's best advertisement. The production of shells ordered by American companies started many new ideas going in that quarter. The paper situation and water-power developments have stimulated things, and in certain lines the Canadian production of chemicals has been a marvel as viewed from abroad.

These are some of the broad reasons behind the desire of American chemical engineers to hold their summer meeting in Canada. The week from June 27th to July 5th, spent in Ontario and Quebec, gave them an opportunity to see these provinces at their best, and Canadian chemists must feel it an honor to know that our chemical industries have developed to a point where they are of such interest to visiting engineers.

We should all know our own country, and it is just possible that there are many Canadian chemists who do not realize that we have plants in Canada well worthy of going a long way to see. There are some Canadian chemists who are not quite sure about prospects here. They are anxious about futures. An opportunity must have a good man to develop it, and even Canadian chances are not at all sure. But the big issues are certain. It is inconceivable that Canada will not draw population, and for the most part

English-speaking people from the United States and England. When a special train spends a week covering the chemical industries and pulp mills of Montreal, Ottawa, Belleville, Shawinigan Falls, La Tuque and Saguenay River, it is some indication that capital is watching Canada, more particularly when our visitors are technical representatives of capital in the United States in a very large way.

These developments must come, as the world needs our resources, and we are indeed glad to welcome them. There were times when the complaint was general that young men from our colleges must go to the United States to find a field large enough for their specialized training. Such a day should be gone or fast closing. Anyone who is not able to find scope for his best efforts here now is probably making a great mistake. There is really nothing very clever about the utilization of a country's resources. It is very obvious that, given population and capital, great systems may be built up. That these necessary forces are about to be set loose in a new way in Canada is indicated most plainly, on such occasions as the event just past. This has been the first time that Canadians were privileged to welcome one of America's most distinguished groups of engineers, as a body, but we hope to see them back again both individually and collectively many times.

INDUSTRIAL CHEMICAL SECTION NOW ASSURED.

CHEMISTRY coming out of its shell—peeping out timidly perhaps, but nevertheless emerging among the stoves, phonographs, rosy apples, fine cattle, peanut vendors and side-shows of the Canadian National Exhibition.

We are now assured that the Industrial Chemical Section is established. To those companies who have responded to the idea, we extend our congratulations. Every new thing finds human nature the same. There are those who pioneer, and do things; and there are others who wait and see. There is no doubt about the general value such an effort may have. Every trade and circle of industries is finding that the public mind is more intelligently enquiring than ever before. The business function of the National Exhibition is growing. No single annual event on this continent draws the same number of people. It was surely high time that the chemical industries of Canada were represented. Whenever chemists and professional engineers generally gather, there is much talk on the question of publicity. If the great "third party" in our social system is going to ever step into an effective position, they must demonstrate to the public generally concrete examples of the methods used in industry, their development, and their dependency on brain-work, and scientific control. Thus, by both direct and indirect methods, the establishment of such a section may become a valuable support to our chemical industries and the manufacturing plants they stand behind.

The novelty and educational features of such a display, when compared with exhibits of many kinds, are outstanding. The industrial fairs of England and the Continent, the Great Chemical Exposition at New York, where nearly four hundred firms show annually, are all indications that very hard-headed business men in the chemical industries have found it well worth while to attain publicity in this way.

There is one way in which the individual chemist may help. Before giving away such a great secret, we would remind a large number that all that has not been done in regard to salaries, necessary technical legislation relating to matters which the chemist has tried to push, and the adoption of chemical economics in national and industrial progress, has been, and is still, almost entirely due to a lack of appreciation or conception on the part of the public as to his existence and the reality of his work. Each individual, then, should consider himself an advertising bureau for such an occasion. The Chemical Section must have the support of the chemist. He must direct his associates, whether they be presidents or much less, to this section. If all the chemists in our industries would thus make it plain to their particular public that they should visit the "Chemical Section," if they are present at the Exhibition, something which is now on trial would probably be doubled another year. From the most selfish point of view possible, this action would be wise, as it would certainly result in a better known and higher value being placed upon the work of chemists generally and those specialized industries peculiar to them.

If you are a Canadian chemist, you cannot help chemistry without helping Canada and yourself.

CHEMICAL QUESTIONS IN PARLIAMENT.

THE questions asked in Parliament are a very good indication of the mental calibre of members. In European countries, it is quite in order and the custom to introduce inquiries of a specific chemical nature, relating to the business of various industries. This indicates that these men have some understanding of the relationship of chemistry to industry in general. The custom is increasing rapidly in the British House, and indicates a healthy attitude of mind on the part of some who are studying affairs of State from that angle. The Congress of the United States has heard from the chemists of America in many ways, and while the reaction is not, perhaps, spontaneous on the part of Congressmen, they too are asking questions and are

being forced at least to consider and listen to chemical arguments.

When has there been a really sane question asked in the House in Ottawa about the chemical industries of Canada? While the Cabinet is busy with affairs of State, there is plenty of time for private members to think up some remarkable questions which might be asked. Some of those that are asked indicate a purility of mind hardly conceivable. These daily jabs that are inserted into the Question Box of the Government, while they may edify personally, are not always very constructive or helpful to anyone. We would put it up to the members of the House of Commons, Ottawa: "Is there a single elected representative of the people of this Dominion capable of asking, from his own knowledge, five constructive questions, relating to the chemical industries of Canada?" There is real need for the honest research mind in public life and a little more first-hand basic industrial information.

"57" USES OF GROUND TALC.

WE are not humorists; neither do we write advertisements for a living. At the same time we were amazed at our own ignorance, after reading a recent report by Raymond B. Ladoo, of the Bureau of Mines, Washington, on the many uses of talc and soapstone. After listing fifty-seven uses he says: "Considerably more attention has been paid to the technology and utilization of talc in Germany and Austria than in this country, despite the fact that the United States produces 56% of the world's talc, and Germany and Austria 5.4%.

Is there never going to be an end to this? Canada produces talc, although we cannot vouch for the "57 Varieties." It is exceedingly nauseating to chemists to be always hearing what Germany did. We advise that they pass this feeling along to those closer to the public purse-strings. If they could be nauseated, something might be done, and this "chemical economics" idea begin to move in a national way.

CANADIAN TRADE STATISTICS.

Exports—For the twelve months ending February 1920, according to the compilation of the Dominion Bureau of Statistics, Ottawa, the value of the asbestos exported from Canada was $9,587,465; of aluminum, $5,222,164; of brass, $1,203,541; copper, $12,225,381; gold, $6,015,444; iron and steel, $61,997,742; nickel, $7,980,509; silver, $15,183,152.

Imports—For the twelve months ending February, 1920, the value of the chemicals imported into Canada was $19,284,556; of anthracite coal, $31,080,765; of bituminous coal, $26,534,357; of paints, colors and varnishes, $4,002,278; of brass, $4,385,541; copper, $7,617,362; gold and silver, $650,690; iron and steel, $149,896,364; lead, $798,312; tin, $10,794,446; zinc, $815,171; rubber, $16,017,241; paper (printing), $51,607,687; other paper, $10,385,123; rubber, $10,203,989; textiles, $20,724,238.

OIL POSSIBILITIES IN PEACE RIVER DISTRICT.

By F. H. Mason.

The British Columbia Department of Lands recently has published a report of the oil survey in the Peace River District, which was made by J. C. Gwillim, Professor of Mining at Queen's University, Kingston, Ontario.

Accompanied for the greater part of the time by Dr. J. S. Stewart, of the Dominion Geological Survey, Dr. Gwillim made a traverse of the country south and southwest of the Peace River Block. They were on the trail from July 23rd to September 3rd, 1919, and then came down the Peace River from Hudson Hope to the town of Peace River, a distance of 240 miles, in an open boat. "In such work the geologist does not usually find oil," Dr. Gwillim writes, "his work is to trace out oil-bearing horizons and favorable structures in the overlying strata, and also to examine any seepages, residues, or other evidences. I saw none, and heard of only one occurrence of bitumen or tarry residue which appeared to be true. I do not think the Imperial Oil Co. geologists doing work on adjacent areas, and on some of the same area as myself, found or certified to such seepages or residues, except in the Dunvegan sandstones on Pouce Coupe River within the Peace River Block."

Dr. Gwillim found the geological conditions and structure of Western Alberta to be very similar to those of the Peace River District, all the way from the Montana boundary to Liard River, a distance of over 800 miles, 400 of which is in British Columbia. There is the same upthrust and overthrust of the Palacozoic rocks of the Rocky Mountains foot ranges, which crumble up overlying Cretaceous formations and cause the foot-hills, a belt of faulted and sharply folded rocks, known as the "Disturbed Belt"; east of this belt the rock folding has been less intense and dies away in gentler undulations until the strata dip eastward to form a long parallel syncline or trough, which underlies Calgary, Edmonton and Dunvegan, on Peace River; still farther east the strata incline upwards into the great plains and then flatten out. It is on the two sides of this great syncline or trough that Dr. Gwillim considers that the most favorable horizons for oil and gas occur. Deep bore-holes that have been drilled on the eastern margin of the great syncline have tapped gas at Bow Island, Medicine Hat, east of Edmonton, and on the Athabaska River. Thick oil and tar have been found in bore-holes east of Edmonton, and on the Lower Athabaska and Lower Peace rivers, but neither the quality nor the quantity, so far, have been encouraging.

Regarding the area covered by the traverse, Dr. Gwillim sums up: "1. No oil has yet been found and no residue or gas-leaks of much importance. 2. There is a possibility of oil existing below some of the favorable structures which occur. 3. The most likely strata are below the St. John shales, which are impervious enough to hold oil down. 4. The Bullhead sandstones, a shore, brackish water, or aerial deposit, lie below the St. John shales; these are geologically more or less contemporaneous with or equivalent to the oil-bearing Loon River strata and the Athabasca tar-sands. They also resemble the Kootenay of Southern Alberta, of much the same horizon, which is believed to be the oil carrier of the Black Diamond field. 5. Assuming the Bullhead sandstones or some underlying formation to produce or carry oil, the necessary work then is to find places where it is structurally favorable and within reach of the drill. 6. The thickness or depths to reach any given horizon are very uncertain, but in some places offer less vertical depth than others. Such places are in valleys or depressions which have been cut deeply into the St. John shales."

Notes on the Economic Aspect of a Canadian Oil Shale Industry.

Statistics and Suggestions Relating to the Development of an Oil Shale Industry in New Brunswick---Review of Work Done in Scotland---A Complete Bibliography of Oil Shale Literature.

By S. C. ELLS

Introduction.

IN the Province of New Brunswick are extensive deposits of oil shales. Commercially these deposits are entirely undeveloped.

In Scotland, during the past sixty-five years, the development of somewhat similar oil shale deposits has passed from the experimental stage to that of a successful and important industry. This success has only been possible through the earnest efforts of able technical men and through adherence to sound financial principles. Success has also been built up on long, laborious and costly experimental work. Obviously it is desirable that, in any attempt to establish an oil shale industry in Canada, every advantage should be taken of the results already secured in the Scotch field.

In discussing the Scotch oil shales and the oil shale industry itself, it would be a very simple matter to compile a highly ornamental monograph of many pages. Indeed, the temptation to do so is strong. Such a report is, however, quite unnecessary and uncalled for, and might, very properly, be considered as a piece of presumption. Incidentally it would also constitute an unnecessary waste of paper. An ample supply of official bulletins answering to this description is already available. The following very brief comment may, however, be permitted.

(a) The Scotch Oil Shale Industry.

Oil shale, the raw material on which the oil shale industry is based, is mined in much the same manner as coal. The principal marketable products are shale spirit, lamp oils, internal combustion engine oils, fuel oils for the navy, oils for gas making and gas enriching, lubricating oils, solid paraffin still coke and sulphate of ammonia.

In Scotland commercial retorting of true oil shale commenced in 1862. The retorting, however, of Torbanehill mineral (Boghead coal) and of certain cannels, was inaugurated toward the close of 1850. Strictly speaking, therefore, the present Scotch oil shale industry may be said to date from that year. By 1871 fifty-one works had been established in Scotland. Since that time the oil shale industry has met with the keenest competition, largely due to the discovery of oil fields in America and elsewhere.

On the other hand, economy and increased efficiency, labor-saving devices,[3] and improvement in the quality of products, have enabled the industry to survive. Meanwhile many of the original companies have passed out of existence, and combination among the remainder has further reduced the number. The output and value of the products have been marked by a steady increase.

At the present time there are in Scotland five operating oil shale companies, viz., Young's, Oakbank, Broxburn, Pumpherston and Ross & Co. Of these, the first four carry on refining operations. Ross & Co. produce only two products,—crude oil and ammonium sulphate. The total capital represented by these companies is about £3,000,000. Approximately 10,000 men are employed underground and on the surface. Generally speaking, during recent years the dividends paid on the capital invested have been fairly satisfactory, as will be seen by the following table:—

Dividends Paid by Principal Scotch Oil Shale Companies.

(1905 to 1917 inclusive)

	Broxburn.	Oakbank.	Pumpherston.	Young's.
1905	15%	15%	30%	6%
1906	15%	15%	30%	6%
1907	15%	15%	50%	6%
1908	17½%	15%	50%	7%
1909	10%	10%	50%	4½%
1910	Nil	5%	30%	Nil
1911	Nil	Nil	35%	Nil
1912	10%	15%	35%	5%
1913	10%	15%	25%	4%
1914	Nil	Nil	10%	Nil
1915	7½%	10%	25%	Nil
1916	15%	15%	40%	5%
1917	15%	15%	40%	6%

A monograph on the Scotch oil shales would be subdivided as follows:—

(1) Geology of the oil shale fields.

(2) Mining methods followed in working the oil shales.

(3) Chemistry of the oil shales (including chemical composition of shales, laboratory methods for testing shales, and processes and products of manufacture).

Each of these aspects of the Scotch oil shale industry has already been fully discussed[4] by those who are in a position to write with the undoubted authority that rests on practical experience extending over many years.

(b) A Canadian Oil Shale Industry.

But, on the other hand, it is entirely legitimate to attempt to draw conclusions from the results that have been attained in the Scotch oil shale industry and, if possible, to apply these conclusions in considering the possible development of our Canadian deposits.

1. Geological. The surface geology of the oil shale area in New Brunswick has already been worked out with quite sufficient accuracy.[5] Detailed topographical maps, on a scale of 1 inch equals 1,000 feet, have also been prepared. This does not, however, nor can it, determine the extent, character, commercial value and workability of the various beds of oil shale that have already been recognized.

In Scotland it has been found that individual beds may vary materially from point to point, as well as with depth, both as regards thickness and quality. Extended, and often costly, experience has fully established the fact that faulting, and the effect of bodies of intrusive rock, are serious factors that must be carefully studied and considered in connection with any proposed development.

In the New Brunswick oil shale field there is, as yet, practically no information available regarding such features. Yet a knowledge of these very features is essen-

[3] It is important to note that the best information available indicates that the introduction of labor-saving devices and reduction in costs generally was possible primarily owing to increased output.

[4] See bibliography.

[5] Joint Report on the Bituminous or Oil Shales of Nova Scotia and New Brunswick. Can. Dept. of Mines. By Dr. R. W. Ells. Topographical and Geological Maps of parts of Albert and Westmoreland Counties (scale 1 inch equals 1,000 ft.). By S. C. Ells. Papers presented before Nova Scotia Mining Inst., 1909-1910. By Dr. R. W. Ells.

tially a prerequisite before extensive development can be undertaken with reasonable safety. It therefore follows that:

A programme of drilling with a view to determining the quality, thickness and continuity of the oil shale seams should be considered as an essential preliminary step. In Scotland heavy expenditure has often been needlessly incurred through insufficient preliminary boring.

2. **Mining Methods.** These should not present any serious difficulty. Methods (usually "stoop and room" or "longwall") adapted to varying conditions, have been fully worked out in the Scotch fields, and may be accepted as standard practice. Full details regarding these have been set forth in an excellent paper by Mr. W. Caldwell, mining engineer of the Pumpherston Oil Company.

In underground development work, such as driving levels (8′ x 12′), cross-cuts, etc., 3½ tons of shale per man per 8 hour shift (7 tons per place with 2 men), may be assumed in average shale. The principal costs (1913) of such work in Scotland were:

	Per Ton. Shillings.	Pence.	
Wages at 8 shillings per man per day	2	4	(1)
On cost men's wages, 1/3 of above...		9½	(2)
Timber		7	(3)
Total	3	8½	

Note—(1) includes cost for powder and fuse, about 4d per ton.

Assuming wages in Canada (1918), corresponding costs would be:

	Per Ton.	
Wages at 18 shillings per day	5 shillings	3 pence
On cost men's wages 1/3 of above	1 shilling	9 pence
Timber		7 pence
Total	7 shillings	7 pence

In subsequently robbing the pillars (in the case of "stoop and room"), this cost would be reduced to approximately 3 shillings 6 pence. In the event of "longwall"[6] being resorted to, the corresponding cost would be reduced by approximately 10 per cent. Pre-war contract prices (1912-1913) for driving levels (8′ x 12′), were approximately 11 shillings per foot, or (assuming 20 cub. ft. per ton), 2 shillings 8 pence per ton.

In the above estimate, ordinary bedded shale is assumed. In the case of curley shale, 5 to 10 per cent. should be added to the cost.

It is impossible to make any accurate estimate of mining cost in the case of open cut work, without further data regarding thickness and character of overburden, distance at which overburden would be wasted, and water available (in case hydraulicing were resorted to). A hydraulicing plant complete, capable of breaking down and removing 75,000 cub. yds. per month, would cost (1913) approximately £1,600. This assumes that the working face is from 30 to 60 feet in height of uncompacted materials, such as gravels, and clay with boulders varying in amount up to 30 per cent. of the whole. Assuming also that the overburden is to be wasted at the end of a pipe line not exceeding 1,500 feet in length, the cost per cub. yd. (wasted), would be well within 3½d. Steam shovel equipment capable of duplicating the above work, would cost (1913) £12,000 to £16,000. In efficiency and speed, the hydraulic methods also show marked superiority. It is probable that the cost of winning oil shales by open cut methods would not exceed 5 shillings 6 pence per ton, and might be reduced to 5 shillings per ton or less.

3. **Chemistry and Products of Manufacture.** In Scotch practice three types of retorts are in use:

(1) Retorts having a circular section. (2) Retorts having an elliptical section. (3) Retorts having an elongated rectangular section.

The Bryson retort used by the Pumpherston Company is circular throughout. The Henderson retort has an elliptical metal (upper) section, but the brick (lower) section is of an elongated rectangular shape. It is said that the Creichton retort adopted by Ross & Co. is similar in this respect, as is also the Fyfe retort used by Young's Company.

In actual practice it has been found that the first of the three has given rather better results, since it requires fewer repairs and possesses greater strength. There is, however, little to choose between the first and third types. In each, the upper (low temperature) zone is of metal, and the lower (high temperature) zone is of firebrick. The life of a retort does not exceed fifteen years.

It must be remembered that all oil products are distilled in the upper (low temperature) zone. Failure to observe this results in loss. The temperature in the chamber surrounding this zone is about 900°F. Distillation takes place at the lowest temperature possible—usually at 600°—700°F.

In the lower part of the retort a temperature of 1,400°—1,600°F. is required (the temperature in the surrounding flues being 1,800°—1,900°F.). Here low pressure saturation steam is introduced into the red-hot shale, and becoming superheated, yields its oxygen to the carbon and its hydrogen to the nitrogen of the shale. The gases produced are thus CO_2, CO, H, and NH_3.

The principal advantage in the use of superheated steam is that it equalizes temperatures, shale and carbon being, of course, poor heat conductors. Otherwise the shale near the outer edges of the retort would be 250°—350° C. hotter than the central zone. Generally speaking, 350°C. may be accepted as the temperature at which the rate of distillation of hydrocarbons commences to materially increase.

As regards temperatures at which initial distillation commences, and the rate at which it subsequently proceeds, valuable research work has recently been carried out by Mr. V. C. Illing, of the Royal School of Mines, London. From the results secured, time-temperature curves have been plotted.

Cracking, which would obviously permit a large yield of gasoline, should be avoided, and the retorts are designed and operated accordingly. Indeed, in Scotch practice, an unduly large yield of spirit (gasoline) is an indication that distillation conditions are not correct. The higher hydrocarbons are desired, with as much heavy oil, and solid paraffin, as possible. In Scotland, intermediate oils (.850—.870) have been cracked for gasoline, but only experimentally.

It has been suggested that a horizontal retort possesses advantages over the vertical type. Scotch practice and experience do not confirm this. Moreover the maintenance of high temperatures in a horizontal (metal) retort would certainly introduce mechanical difficulties. On a laboratory scale, the horizontal type of retort will give satisfactory results. In commercial practice, cracking is inevitable, since adequate control of temperature is impracticable. In any case, should it be decided not to use a

[6] In the Scotch fields "Longwall" methods have usually been adopted in mining thin, rich seams.

vertical type of retort, it is probable that an inclined retort would have advantages over a horizontal type.

In all calculations it is essential to remember that, in the test of New Brunswick shale, made at Pumpherston in 1908, results appeared to indicate that retorts would not handle as large a tonnage of the Canadian as of the Scotch shale, owing to the fact that the former was much richer. Rich shales also have a much greater tendency to intumesce,—a fact which was amply established in retorting the shales of New South Wales, where the retorts repeatedly choked[7]. In the 1908 test, a Standard Scotch retort, with a through put capacity of 4 tons of Scotch shale per 24 hours, did not pass through more than 2¼ tons of New Brunswick shale. In the case of the richer shales, additional care will also be required in order that the off-takes do not become choked through premature condensation of the gases.

The rate of through put is controlled by the time required to recover the nitrogenous values. If a recovery of hydrocarbons were the only object, the upper (metal) zone of the retort would, of course, be lengthened and the through put increased almost indefinitely. Too much importance should not attach to the fact that only 2¼ tons of one particular shipment of New Brunswick shale was passed through in 24 hours. It is probable that with proper,—and radical,—modification of the retort, a considerably better showing may be expected in the treatment of much of the New Brunswick material.

As regards certain essential features, the oil shales of New Brunswick differ materially from those of the Scotch fields. The principal differences may be briefly stated as follows, although, in nearly all shales, frequent variation is met with from point to point:—

	Scotch Shales.	Canadian Shales.
Average yield crude petroleum	20 galls.	40 galls.
Average yield sulphate of ammonia..	40 lbs.	80 lbs.
Average yield paraffin	11 galls. per 100 galls.	3 galls.
Average yield heavy Naphtha (gr. 767)	9 galls.	1.5 galls.
Average yield burning oil	22 galls. per 100 galls.	11 galls.
Average refining losses	24%	56%

The high refining loss (56%) is abnormal, and may be due to the strength of acid used,—a condition which would reduce the percentage of olefine products. Adjustment in the technique of refining would almost certainly have shown much better results. Such a loss would indicate that the true character of the New Brunswick petroleum was not thoroughly understood.

The yield of paraffin (3 galls. per 100 galls.) from the shipment of New Brunswick shale is also low, but on the other hand, results from a single shipment of shale are not conclusive. A series of tests of samples from different beds may materially alter the above result. Normal experience elsewhere with various shales, conclusively supports this statement.

At the Scotch oil shale works the following products are profitably recovered:—

Permanent gases used for fuel for retorts (supplemented by coal gas from producers when shales are poor in permanent gas).
Shale napthas (grav. .740).
Special oils (including burning oils), grav. .785 — .870.
Lubricating oils — grav. .865 — .890.
Solid paraffin.
Sulphate of ammonia.

[7]Choking is due to intumesence of shale—not to fusing of ash.

Conditions affecting costs of materials and labor, as well as market quotations on the various shale products, are at present very unsettled. It is therefore impossible to rule in the Scotch oil shale industry at the present time. It is, however, possible to consider pre-war figures[8] (1913), which were approximately as follows:—

Mine and Retort Labor.
Miners' wages ..... 7 shillings 6 pence per day
Helpers' wages ..... 7 shillings per day.
Shiftmen (general mine labor) 5 shillings per day.
Men employed about retorts, condensers, etc. .....50 shillings per week.
General surface labor .....35 shillings per week.
Supervision.
Mine manager .....£220 per annum.
Mine under-manager .....50 shillings per week.
Retort foreman .....50 shillings per week.
Cost of mine timber (3" to 6")..14 shillings per 100 feet.
Cost of mine timber (6" to 12")..30 shillings per 100 feet.

The following estimate of the approximate cost of a Crude Shale Oil Plant, with a through put of 400,000 tons Scotch shale per annum, has been prepared by A. F. Craig & Co., Ltd., Caledonia Engine Works, Paisley, Scotland. The figures are based on an estimate made up in 1913 for a Plant to be erected in Scotland. The retorts are of the "Pumpherston" type. A. F. Craig & Co. are the leading makers of Shale Oil Plants:—

	£	s.	d.	
Crude oil plant	104,400	0	0	net
Naphtha recovery plant	1,810	0	0	"
Sulphate of Ammonia plant	3,480	0	0	"
Steam boiler plant, consisting of 4 steam boilers, 2 economizers, 3 boiler feed pumps, etc.	8,690	0	0	"
Brickwork for 4 "Stirling" boilers, 2 economizers, 1 chimney, foundations, etc.	2,270	0	0	"
Mechanics' repair shop	1,325	0	0	"
Total.....	£121,975	0	0	

In the case of a Plant erected in Canada, freight charges must be added. If, on the other hand, it appeared desirable that the equipment be manufactured in Canadian shops, complete working drawings of all Plant above itemized could be secured for about £500.

Market Prices of Products (1913).

	Per cent. of Crude.	Price per Gallon.
Motor spirit and naphthas (.715-.740)	9	7½d.
Special oil (.785), crystal oil (.800) and No. 1 burning (.805)	18.7	4¾d.
Lighthouse oil (.810)	3.3	4¾d.
Mineral or marine sperm (.830), mineral colza (.840), gas oil (.855), grease oil, cleaning oil (.870)	25	3¼d.
Lubricating oil (.865), (.875), (.885), (.890)	9.0	4¾d.
		Per lb.
Paraffin wax	11	1¾d.
		Per ton.
Sulphate of ammonia		£13 5s.

If, however, for the sake of argument, the high refining losses (56%) referred to above are accepted, it appears that in the case of the New Brunswick shales four products only would be profitably recovered:—

Permanent gas.
Motor spirit (grav. .767).
B. Oil (grav. .795).
Fuel Oil (grav. .865).
Sulphate of Ammonia.

It is possible that marketable burning oil could not be profitably recovered, but considering the selling price of burning oil, and also the fact that the gasoline output could be increased by the elimination of the burning oil fractions, this consideration is not a serious one.

In adopting this series of products, only enough of the lighter fractions would be removed to sufficiently reduce the flash point of the crude. Moreover the serious refining losses would be eliminated and manipulation in the process of manufacture greatly simplified. In any event, such a

[8]All estimates and costs in this report are based on quotations which ruled in 1913.

system would be desirable in the initial development of a new industry.

4. Markets. Sufficient data is not at present available regarding present and probable future markets, transportation and competition. The writer considers that this feature cannot be too highly emphasized.

(c) Summary.

Experience and a large amount of available data show that proposed commercial development should provide for a through put of not less than 1,000 tons per 24 hours. In view of the great initial outlay that this would entail, it is evident that,—

1. As a preliminary step, complete data should be secured by boring, regarding character of shale and condition of seams in any area in which development is proposed.

The unexpected discoveries resulting from extensive drilling by the New Brunswick Gas & Oilfields, Ltd., in the Stoney Creek field, Albert County, is a striking illustration of the necessity for such work.

2. So far as possible reliable and complete statistics should be secured regarding markets, prices of products, etc. These are not available at present.

3. Different shales cannot be treated with equal efficiency in the same type of retort. Thus, a retort that might prove eminently successful in treating Scotch shales would not necessarily be equally successful in the case of New Brunswick shales. Therefore, before making any decision regarding the type of retort to be used, complete experimental work should be undertaken. In this it would be advisable that a single retort approximating commercial capacity (4 tons) should be used. During such a series of tests modifications in the design of the retort itself, size of shale fed into retort, ideal working temperature, etc., could be investigated in such a manner as to ultimately secure maximum efficiency. It appears that the vertical type of retort has distinct advantages over the horizontal type. At the outset, therefore, a type of retort, somewhat similar to those which have proved satisfactory in Scotch practice, could be installed and subsequently modified as the experimental work progressed. Working drawings of such a retort can be secured at a reasonable cost.

Indeed, in any attempt to establish an oil shale industry in New Brunswick, a commencement should be made almost from first principles. As basic principles, however, the use of a vertical retort, superheated steam, and a double temperature reaction may be accepted. Apart from this the question of dimensions of the retorts, length of high and of low temperature sectors, temperatures to be maintained in each sector, size of shale as fed into retort, etc., must be determined de novo. To attempt to duplicate Scotch practice in the manipulation of a material which, as regards certain characteristics, appears to be distinctly different from Scotch shale, would simply be to court disaster.

In actually commencing operations, and coincident with preliminary drilling, a laboratory should be established in charge of someone who is properly qualified by training and by experience. The results obtained in such a laboratory should not vary by more than 5 per cent. (higher or lower) from those that might subsequently be expected under actual commercial conditions. This variation will depend largely on the skill of superintendence at the Plant.

Using the results of the core samples as a guide, 15-20 ton samples of the various types of shales could then be secured, and results from the treatment of these utilized in planning subsequent commercial manipulation.

It is important to note that, in crushing, various shales show wide variation in the character of the crushed product,—particularly as regards the percentage of fines. This feature is worthy of special study in the case of each particular type of shale.

Scotch refinery practice has attained an unusually high standard of efficiency. It is owing in no small degree to this fact that the success of the Scotch oil shale industry has been possible. Even to-day it is doubtful whether the selling prices of Scotch shale oils,—especially the lubricating fractions,—represent the true market value of these high grade products. Therefore, at the outset, a thorough study should be made of the hydrocarbons,—particularly the lubricating oils,—derived from the New Brunswick crude shale oil. It is to no small extent owing to the specialization of refinery technique, and by the production of high-grade refined products of a special character, that the Scotch oil shale industry has succeeded.

Although the existence of the oil shale deposits of New Brunswick has been recognized for many years, commercial development has not yet been commenced. After the long delay which has already taken place there is every reason why precipitate action at the present time should not be allowed to endanger ultimate chances of success.

Many years of preliminary work were necessary before the types of retorts now used in Scotch practice were finally evolved. In New Brunswick it is apparent that much preliminary work,—possibly extending over two or three years,—must be carried out. Present indications appear to justify such preliminary work[9]. If the struggling Scotch oil shale industry in the early days, with imperfectly developed devices, could compete with free petroleum during the period when there was an over-supply from the American fields, it should be able to do so now when demands are becoming equal to, or even exceeding, the supply. It is estimated that the supply of free petroleum, originally available in the American fields, has already been depleted to the extent of 60 per cent., and there appears to be a possibility that export from the United States may ultimately be prohibited altogether.

As regards ammonium sulphate, there seems to be no indication that the present selling price will become materially lower. All countries are now beginning to realize the importance of more intensive agricultural methods. Moreover, a greater available supply of sulphate will probably create a greater demand. The present supply does not meet the present demand.

(d) Probable Profits of a Canadian Oil Shale Industry.

Using as a basis a large amount of data secured through various,—and apparently responsible,—channels, the following financial estimate has been prepared. It is believed that the figures given are conservative. Cost of plant is based on pre-war figures:—

Estimate of probable Refined Products from Crude Oil and their net value on a Through put of 365,000 tons of shale per annum.

Assumed yield per ton of 2,240 lbs. Crude oil 38 galls. S/Ammonia 57 lbs. Scrubber Naptha 2½ galls.

Dr. To cost of raising shale, 365,000 tons at 5 shillings per ton £91,250

[9]Owing to high costs of materials and unsettled labor conditions, the present time is peculiarly adapted to carrying on such preliminary work.

" " " retorting shale, 365,000 tons at 2 shillings per ton	36,500
" " " manufacturing S/Ammonia, 9,288 tons at 104 shillings per ton....	48,297
" " " refining crude oil and naptha....	25,093
" profit, without making allowance for depreciation.	161,315
	£362,455

Note:

1. Profit per ton of shale, 8/10d.
2. Profit after deducting 10% for depreciation is equal to 29% on a capital of £500,000.
3. The price of £15 per ton of sulphate of ammonia means on rail at works.
4. The price of oils, naked at works.
5. All general and fixed charges are included in the cost of production and are proportionately divided over the various departments.
6. The percentage of products is taken from the test of New Brunswick shales at Pumpherston in 1908. Report by Dr. R. W. Ells, Dept. of Mines, Canada.

The shales referred to were taken from the Baltimore property.

Cr. By Naptha 1.62% 222,650 galls. at 6d. per gall.	£5,566
" B. Oil 11.50% 1,595,050 galls. at 4d. per gall	26,584
" Fuel Oil 78.00% 41,610 tons at 60 shillings per ton	124,830
" S/Ammonia, 9,288 tons at 300 shillings per ton	139,320
" Scrubber Naphta 912,500 galls. at 6d. per gal	22,812
" Gove. Bonus of ¾d. per gall. crude oil, 13,870,000 gall.	43,343
	£362,455

(e) Conclusions.

It appears from the above that with conservative management and sound financial organization the prospects for a successful oil shale industry in Eastern Canada are good. In making this statement markets for the various products are assumed. Success would also depend on making no false,—and expensive,—moves in the first place and in having no "lost motion" in subsequent operations.

The oil shales of Eastern Canada constitute a great potential source of national wealth. As yet these deposits are entirely undeveloped.

During the past fifteen years the merits of the deposits have been reported on by a number of experts, engagd by private interests. Some of these men have been qualified by training and experience to speak authoritatively.

From time to time the writer has been enabled to secure access to a number (7) of the reports. Of these, three have been favorable, one has been non-committal, and three have been unfavorable.

Expert opinion thus appears (ostensibly) to be divided regarding the probable true merit of the New Brunswick oil shales. To what extent this divergence actually exists is quite another matter.

Author's Note.

Since the above was written, the Scotch oil shale industry has passed under the control of one of the largest British petroleum companies. It is also understood that a subsidiary of the same company has acquired control of the great part of the oil shale areas in Albert and Westmoreland counties, N.B.

From the data given above, corresponding working costs, applicable to present conditions in New Brunswick, may be deduced.

1st C.E.R.B. S. C. ELLS.

Seaford, Jan. 5, 1919.

Bibliography.*

Allen, A. H.—"On the Relative Proportion of Olefines in Shale and Petroleum Products." *Analyst.* Vol. vi., pp. 177-180. 1881.

Armstrong, J. T.—"The English Oilfields." *Petrol. Rev.* Vol. xxx, pp. 383-385. 1914.

Barlow, J.—"On Mineral Candles and Other Products Manufactured at Belmont and Sherwood." *Proc. Roy. Inst.* Vol. ii, p. 506. 1858.

Beilby, G.—"The Production of Ammonia from the Nitrogen of Minerals. (Scotch shales). *Jour. Soc. Arts.* Vol. xxxiii, pp. 313-320. 1885.
"The Nitrogen of Crude Petroleums and Paraffine Oils." *Jour. Soc. Chem. Ind.* Vol. x, pp. 120, 121. 1891.
"Thirty Years of Progress in the Shale Oil Industry." *Jour. Soc. Chem. Ind.* Vol. xvi, pp. 876-886. 1897.

Bennett, J. H.—"An Investigation into the Structure of the Torbanehill Mineral, and of Various Kinds of Coal." *Quart. Jour. Micr. Sci.* Vol. iii, pp. 185-198. 1855.

Bertrand, C. E.—"Caracteristiques du Charbon Humique de Broxburn, pres Bathgate" (Ecosse). *Ann. Soc. Geol. Nord. Compt. Rend.*. T. cxxiv, pp. 1377-1379. 1897. T. xxiv, pp. 129-134.
"Les Charbons Humique et les Charbons de Purins." *Compt. Rend. Assoc. Franc.* Sess. xxvi, pt. 2, pp. 328-340. 1898.
"Charbons Gelosiques et Charbons Humiques." *Compt. Rend. Congr. Geol. Internat.* Sess. viii, pp. 458-497. 1901.

Bolley, P. A.—"Paraffin, fertig gebildet in Bogheadschiefer, Schweiz." *Polyt. Zeitschr.*, bd. v, p. 55. 1860. *Polyt. Journ.* bd. clvii, p. 160.

Brown, J. F. K.—"Oil Shale Mining." (Western Br. Scott. Fed. Inst. Min. Stud.) *Iron and Coal Trades Review.* Vol. lxxxviii, pp. 352-353. 1914.

Bryson. *Jour. Soc. Chem. Ind.* P. 990. 1897.

Cadell, H. M.—"The Oil Shales of the Scottish Carboniferous System." *Journ. Geol.* Vol. ii, pp. 243-249. 1894.
"Geology of the Oilshale Fields of the Lothians." *Trans. Edinb. Geol. Soc.* Vol. viii, pp. 116-162. 1901.
"The Oilshale Fields of the Lothians." *Trans. Inst. Min. Engr.* Vol. xxii, pp. 314-371, pl. ix. 1902.

Cadell, H. M., and J. S. Flett.—"On an Ash-Neck in the Broxburn Shale Workings at Philipstown." *Trans. Edinb. Geol. Soc.* Vol. vii, pp. 477-481. 1899.

Cadell, H. M., J. S. G. Wilson, W. Caldwell and D. R. Steuart.—"The Oil Shales of the Lothians." *Mem. Geol. Soc. Scotl.* Pp. viii, 194; 3 pls. 1906.

Caldwell, W.—"The Working of Oil Shale at Pumpherston." *Trans. Inst. Min. Engr.* Vol. xxxvi, pp. 581-589. 1909.

Carruthers, R. G., W. Caldwell, and D. R. Steuart.—"The Oil Shales of the Lothians." *Mem. Geol. Surv. Scotl.* Ed. ii, p. xii, 199; 3 pls. 1912. See Cadell, H. M.

Chesneau, G.—"L'Industrie des Huiles de Schiste en France et en Ecosse." *Ann. Mines*, ser. 9, t. iii, pp. 617-674. 1893.

Craig, E. H.—"The Origin of Oil Shale." *Inst of Pet. Tech.* 1916.

Carne, J. E.—"Kerosene Shales of New South Wales." 1903.

Craig, E. H.—"The Origin of Oil Shale." *Proc. Royal Soc. Edinb.* Vol. 36. 1915. P. 44.

Craig, Perkin and others.—"The Scotch Oil Shale Industry." 1918.

Creighton.—*Jour. Soc. Chem. Ind.* P. 998. 1897.

Ells, R. W.—"Bituminous Shales in Nova Scotia and New Brunswick, with notes on the Oil Shales of Scotland." Summ. *Rep. Geol. Surv.*, Can., for 1908, pp. 132-142, 8 vo. Ottawa, 1909.

*Based on bibliography by W. H. Manfield, "Jour. Inst. Petrol. Tech," April, 1916.

"Notes on the Geology of the Oil Shales of Scotland, and Their Relation to Somewhat Similar Shales in Eastern Canada." *Trans. Royal Soc. Can.* Ser. 3, vol. iii, sect. iv, pp. 35-44. 1909.

"Report on Tests made in Scotland of Oil Shale sent from New Brunswick." *Can. Dept. of Mines.* Report No. 55. 1910.

"The Oil Shales of the Maritime Provinces." *Trans. Min. Inst. of Nova Scotia.* Vol. xiv, sess. 1909-10. Pp. 1-13.

Galletly, J.—"On a Paraffine (from Boghead coal), having a high melting point." *Chem. News.* Vol. xxiv, pp. 187, 188. 1871.

Garrett, F. C., and J. A. Smythe.—"The Bases Contained in Scottish Shale Oil." Part I. *Jour. Chem. Soc.* Vol. xxxi, pp. 449-456. 1902.

Geikie, A.—"The Geology of Central and Western Fife and Kinross." Being a description of Sheet 40, and parts of Sheets 32 and 34 of the Geological Map. Pp. x, 284. *Mem. Geol. Surv., Scotland.* 1900.

"The Geology of Eastern Fife." Being a description of Sheet 41 and parts of Sheets 40, 48 and 49 of the Geological Map. Pp. xvi, 421; 12 pls. and map I: 126 and 720. *Mem. Geol. Surv., Scotland.* 1902.

Geuther, A.—"Ueber die Natur und Destillations-producte des Torbanehill minerals." 8 vo. Gottingen, 1855.

Goodchild, J. G.—"Some of the Modes of Origin of Oil Shales, with Remarks on the Geological History of some other Hydro-carbon Compounds." *Trans. Edinb. Geol. Soc.* Vol. vii, pp. 121-131. 1897.

Gray, T.—"The Phenols from Shale Oil." *Journ. Soc. Chem. Ind.* Vol. xxi, pp. 845-847. 1902.

Green, Burton.—"Kimmeridge Shale, its Origin, History and Uses." Pp. 22, 8 vo. London. 1886.

Gregory, W.—"Composition of the Boghead Coal." *Quart. Journ. Micr. Sci.* Vol. ii, pp. 200, 201. 1913.

Groeling, A. E. von—"The Scottish Shale Industry." *Engineer.* Vol. cxvi, pp. 218, 219, 252, 275-277. 1913.

Hamor, W. A.—"The Technology of the Scottish Oil Shale Industry." App. (pp. 37-57), in R. W. Ells' Report (see above). *Canada Dept. Mines; Report No.* 55. 1910.

Hellsing, G.—"Skifferoljeindustrien i Skottland och Frankrike." *Sver. geol. Unders., Arsb.*, 1907, no. 2, pp. 92, pl. 1906.

Henderson, N. M.—"Shale Retorts at Broxburn." *Journ. Soc. Chem. Ind.* Vol. xviii, pp. 246-248. 1899.

Henriques, R.—"Die Scottische Schieferolindustrie." *Chem. Rev. Fett-Harz-Ind.*, bd. v, pp. 61-64, 81-86, 108-112, 125-129. 1898.

Herapath, T. J.—"The Torbanhill Mineral." *Chemist*, ser. 3, vol. i, pp. 207-208. 1854.

Heusler, F.—"Ueber die Zusammensetzung der schottische Schiefertheerole, ein Beitrag zur Theorie der Theerbildung." *Ber. deutsch chem. Ges.*, bd. xxx, pp. 2743-2752. 1897: *Journ. Chem. Soc.*, vol. lxxiv, pt. i, pp. 101, 102. 1898.

Howell, H. H., and A. Geikie.—"The Geology of the Neighborhood of Edinburgh." (Map 32). *Mem. Geol. Surv.* Gr. Br., London, 1861. (*Petroleum*, &c., pp. 28, 39, 46, 116.)

Irvine.—*Jour. Soc. Chem.* Ind., p. 1038. 1894.

Joffre, J.—"Sur l'analyse de combustibles mineraux nouvellement exploites en Ecosse." *Bull. Soc. Chim., Paris*, ser. 2, t. x, p. 8. 1868.

Lunge, G.—"Die Paraffinolfabrik von J. Young (zu Bathgate, Schottland)." *Polyt. Journ.*, bd. clxxxi, pp. 456-462 (1866): *Ann. Gen. Civ.*, t. vii, p. 57. 1868.

Mackie, S. J.—"Torbane Hill Mineral." *Geologist*, vol. iv, p. 369. 1861.

M'Killop, G. T.—"Distillation of Oil Shale in Scotland (Jun. Scottish Gas Assn.). *Iron and Coal Trades Rev.* Vol. lxxxvii, p. 268. 1913.

Magnier, M. D.—"Nouveau Manuel complet de la fabrication et de l'emploi des huiles minerales, contenant la description des procedes et appariels de fabrication des huiles de petrol, de boghead, de schiste, etc." 18 mo. Paris. 1867.

Manfield, W. H.—"Oil Shales with special reference to those of the Dorsetshire Kimmerigian Series." *Jour. Inst. Petroleum Technologists*, April. 1916.

Marvin, C.—"England as a Petroleum Power; or the Petroleum Fields of the British Empire." 8 vo. London. 1887.

Matter, O.—"Analyse der Boghead Kohle." *Journ. prakt. Chem.*, bd. lxxvii, pp. 38-44. 1859.

Mayer, J.—"The Mineral Oil Industry of Scotland." *Min. Mag. Rev.* Vol. i, pp. 118-128. 1872.

"Torbanehill Mineral." *Ibid.* Vol. ii, pp. 1-10. 1872.

Moore, R. T.—"The Mineral Oil Industry of Scotland." *Trans. Fed. Inst. Min. Eng.* Vol. iv, pp. 36-47. 1893.

Pinno.—"Bemerkungen uber das Vorkommen und die Verwerthung der Boghead-Kohle, und de olfuhrenden Schlfer in Schottland." Zeitschir. Berg-Hutt. Salinenw, bd. xxxiv, p. 129. 1886.

Pyhala, E.—"Die nadelformingen Paraffin-Krystalle und ihre Bedeutung fur das Schottlandische Schwitzverfahren bei der Paraffinfabrikation." *Compt. Rend. Congr. internat. Chim. appl.*, sess 7, sect. 4, pp. 32-38. 1910.

Quekett, G.—"On the minute structure of a peculiar combustible mineral from the Coal-Measures of Torbane Hill, near Bathgate, Linlithgowshire, known in commerce as Boghead Cannel Coal." *Trans. R. Microsc. Soc.*. Vol. ii, pp. 34-65. 1854.

Redfern, P.—"On the Nature of the Torbane Hill and other Varieties of Coal." *Quart. Journ. Micr. Sci.* Vol. iii, pp. 106-127. 1854.

Redwood, B.—"Petroleum: a Treatise on the Geographical Distribution and Geological Occurrence of Petroleum and Natural Gas; the Physical and Chemical Properties, Production and Refining of Petroleum and Ozokerite; the Characters and Uses, Testing, Transport, and Storage of Petroleum Products, and the Legislative Enactments relating thereto; together with a description of the Shale Oil and Allied Industries." 2 vols., 8 vo. London, 1896; 1906 (3 vols.), 1913.

Redwood, I. I.—"A Practical Treatise on Mineral Oils and their By-Products, including a short history of the Scotch Oil Shale Industry, the Geological and Geographical distribution of Scotch Shales, Recovery of Acid and Soda used in Oil Refining, and a list of Patents relating to Mineral Oils." 8 vo. London and New York. 1897.

Robertson, J. B.—"A Chemical Examination of the Organic Matter in Oil Shales." *Proc. Roy. Soc. Edinb.* Vol. xxxiv, pp. 190-204. 1911.

Robinson, G. C.—"On some new bases of the Leucoline Series (in Scotch Shale Oil)." *Trans. Roy. Soc. Edinb.* Vol. xxviii, pp. 561-570, vol. xxix, pp. 215-272, 273-279. 1880.

Rowan, F. J.—"On the Physical Conditions existing in Shale-distilling Retorts." *Journ. Soc. Chem. Ind.* Vol. x, pp. 436-443. 1891.

Sneddon, J. B.—"Description of the Duddingston Shale Mines and the Niddrie Castle Crude-oil Works." *Trans. Inst. Min., Eng.* Vol. xxvi, pp. 122-133. 1903.

"Description of the Aerial Ropeway from the Shale Mines to the Oil Works at Oakbank, Mid-Calder." *Ibid.* Vol. xlii, pp. 300-307. 1912.

Steuart, B. R.—"Contribution to the Composition of Shale Naptha." *Journ. Soc. Chem. Ind.* Vol. xix, pp. 986-989. 1900.

Steuart, D. R.—"On the Occurrence of Petroleum in a Shale Mine at Broxburn." *Ibid.*, vol. vi., pp. 128-130, 352. 1887.

"Refining Shale Oil." *Ibid.*, vol. xviii, pp. 248, 249. 1899.

"The Oil Shale Industry of Scotland." *Econ. Geol.*, vol. iii, pp. 573-598. 1908.

"The Occurrence of Petroleum at Broxburn." *Trans. Edinb. Geol. Soc.* Vol. x, pp. 38, 39. 1912.

Taylor, A.—"On the Bituminous Shales of Linlithgowshire and Edinburghshire." *Proc. Phys. Soc. Edinb.* Vol. iii, pp. 16-24. 1862.

"Sketch of the Geology of the Torbane Mineral Field." *Geologist.* Vol. v, pp. 43, 47. 1862.

"Scotch and Welsh Mineral-Oil Trades." *Trans. Edinb. Geol. Soc.* Vol. i. pp. 19, 20. 1868.

"On Bitumen, Oil-Shales and Oil-Coals." *Ibid.*, vol. ii, pp. 187-189. 1873.

"On the Nomenclature of the Hydrocarbon Compounds, with a suggestion for a new classification." *Min. Mag.* Vol. vii, pp. 13-17. 1886.

Tervet, R.—"Sulphur in Shale Naptha." *Chem. News.* Vol. xlv., p. 98. 1882.

Tervet. R.—*Jour. Soc. Chem. Ind.* P. 1028. 1895. P. 355, 1887.

Traill, T. S.—"On the Torbane Hill Mineral." *Trans. R. Soc. Edinb.* Vol. xxi, pp. 7-13. 1857.

Wagenmann, P.—"Ueber neue in Schottland vorkommende Rohmaterialen zur Photogen-und Paraffinfabrication." *Polyt. Journ.*, bd. cli, pp. 116-119; bd. clii, p. 113. 1859.

Walker, T. L.—"The Crystalline Symmetry of Torbanite." *Amer. Journ. Sci.*, ser. 4, vol. vi, pp. 41-44. 1898.

Weed, R.—"Oil Shales in Scotland." *Iron and Coal Trade Review.* Vol. lxxix, pp. 205, 206. 1909.

Williams, C. G.—"On the Volatile Bases Produced by Destructive Distillation of the Bituminous Shale of Dorsetshire." *Jour. Chem. Soc.* Vol. vii, pp. 97-107. 1854.

"On the Presence of Pyridine in Naptha among the Volatile Bases in the Naptha and the Bituminous Shale of Dorsetshire." *Phil. Mag.*, ser. 4, vol. viii, pp. 209-212. 1854.

"On Some of the Products of the Destructive Distillation of Boghead Coal." *Phil. Trans.*, 1857, pp. 447-462, 737-745.

"On the Hydrocarbons produced by Destructive distillation of Boghead Coal." *Journ. Chem. Soc.* Vol. xv, pp. 130-134. 1862.

"On the Formation of the Iodides of the Alcohol Radicles from Boghead Naptha." *Ibid.*, pp. 359-363. 1862.

Williams, C. G.—"On Bathvillite, a new inflammable Mineral (from Bathville, near Torbane Hill)." *Chem. News.* Vol. vii, pp. 133-135. 1863.

Anonymous Reports.

"Petroleum and Shale Oil. Report of the Experiments at Woolwich Dockyard, with a view of testing the value of Petroleum and Shale Oil as substitutes for Coal in raising Steam in Marine Boilers." Admiralty Publication, 1866.

"Mines and Minerals. Annual General Reports upon the Mineral Industry." 1894-96, fo. London, 1895-97.

"Mines and Quarries. General Reports and Statistics." 1897, 1898.

"The Oil Industry of Scotland. How the Shales are worked." *Petrol. Rev.* Vol. xvi, pp. 119-121. 1907.

There is also an extensive French and German literature on the above subject.

American Contributions.

The following references to American writings have been kindly furnished by Mr. Martin J. Gavin, Refinery Engineer, Bureau of Mines, Mining Experiment Station, Salt Lake City, Utah.

Abraham, Herbert.—Asphalts and allied substances. Their occurrence, modes of production, uses in the arts and methods of testing. New York, Van Nostrand, 1918. 600 pp.

Alderson, V. C.—"The oil shale industry." *Colorado School of Mines Quarterly*, vol. 14, Oct., 1919, pp. 4-15. Nature and origin of oil shale, its world-wide distribution and present value, description of the Colorado shales and discussion of the present status of the industry and its future prospects. See also Salt *Lake Min. Rev.*, vol. 21, Oct. 30, 1919, pp. 25-26.

Ashley, G. H.—Oil resources of black shales of the Eastern United States." *U. S. Geol. Survey Bull.* 641, 1917, pp. 311-324.

Bacon, R. F., and Hamor, W. A.—"The shale oil industry." Chapter 17, pp. 807-814, of *The American Petroleum Industry*, 1916. General discussion on the Scottish shale industry.

Bacon, R. F., and Hamor, W. A.—"Problems in the utilization of fuels." *Jour. Soc. Chem. Ind.*, vol. 38, June 30, 1919, pp. 161T-168T. Includes discussion of the commercial status of American oil shales.

Baskerville, Charles.—"Value of American oil shales." *Bull. Am. Inst. Min. Eng.*, June, 1919, pp. 957-960. Enumerates and discusses briefly the factors on which the economical success of the shale oil industry depends; discusses choice of suitable processes of treatment and the urgent need of shale oil to meet the deficiency in fuel oil.

Botkin, C. W.—"The composition of oil shale and shale oil." *Colorado School of Mines Quarterly*, vol. 14, Oct., 1919, pp. 16-17. Gives figures based on a large number of analyses of Colorado, Utah, Wyoming and Nevada shales.

Bowen, C. F.—"Phosphatic oil shales near Dell and Dillon, Beavershead County, Montana." *U. S. Geological Survey Bull.* 661, 1918, pp. 315-320.

Branner, J. C.—"The oil bearing shales of the coast of Brazil." *Trans. Am. Inst. Min. Eng.*, vol. 30, 1901, pp. 539-544. Describes the occurrence of Eocene oil shales along the east coast.

Condit, D. D.—"Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah." *U. S. Geological Survey Bull.* 711-B, 1918. 26 pp. Gives geologic sections of these districts, describes mode of occurrence of the shale and samples tested, and concludes with practical considerations on the technology of shale oil.

Chemical and Metallurgical Engineering.—"The present status of oil shales." Vol. 20, Jan. 1, 1919, pp. 28-31. Review of the situation in the western United States, including general description of the deposits, brief account of activities toward developing processes of treatment, and explanation of the difference between oil shales and asphaltic sandstones and their treatment.

Davis, C. A.—"Some fossil algae from the oil-yielding shales of the Green River formation of Colorado and Utah." *Bull. Geol. Soc. Am.*, vol. 27, March, 1916, pp. 159-160. (Abstract.)

Gavin, M. J., Hill, H. H., and Perdew, W. E.—"Notes on the oil shale industry, with particular reference to the Rocky Mountain District." *U. S. Bureau of Mines*, May 1, 1919. 51 pp. Mimeographed report. General discussion of the subject, with bibliography.

Gilbert, Chester G., and Pogue, Joseph E.—"Petroleum: A Resource Interpretation." *U. S. National Museum-Smithsonian Inst. Bull.* 102, part 6, 1918, pp. 49-53, 71-73. Discusses oil shale as an economic resource and recommends a policy for the development of the industry.

Hoskin, A. J.—"The oil shale industry." *West Eng.*, vol. 9, May, 1918, pp. 191-198. Describes the industry in Colorado, with cost estimates and analyses.

Jakowsky, J. J., and Sibley, F. H.—"Shale deposits of United States rich in oil." *Oil and Gas Jour.*, vol. 18, Nov. 7, 1919, pp. 58, 60, 62-64. Gives brief history of the industry, properties of oil shale, description of Scotch methods of mining and retorting shale, average yield of Scotch and American shales, properties and uses of different oils recovered from shale crude, brief descriptions of representative types of American retorts being developed at present, and discussion of the outlook for the industry from a commercial point of view.

Lunt, H. F., and others.—"The oil shales of northwestern Colorado." *Colorado State Bureau of Mines Bull.*, No. 8, Aug. 1, 1917, 59 pp. A brief and non-technical summary of the most recent and authoritative information on oil shales, particularly the Colorado deposits, including description of the areas in Colorado in which shale occurs and general commercial consideration as to mining and refining of shale and marketing of its products. Discusses, also, methods of acquiring oil shale lands, value of such lands, and mining regulations in the State. Concludes with bibliography.

Mitchell, G. E.—"Billions of barrels of oil locked up in rocks." *Nat. Geog. Mag.*, vol. 33, Feb., 1918, pp. 195-205. Review of oil shale resources of the United States.

Morrell, J. C., and Egloff, Gustav.—"Destructive distillation of oil shales." *Chem. and Met. Eng.*, vol. 19, July 15, 1918, pp. 90-96; discussion, Aug. 1, p. 112, by Louis Simpson. Reprinted in *Oil and Gas News.* (See Egloff, G, and Morrell, J.C.)

Oil, Paint and Drug Reporter.—"Shale oil standardization work on large scale planned by U. S." Vol. 96, July 28, 1919, Sec. 11, p. 16. Outlines three possible programmes to be carried out by the U. S. Bureau of Mines in shale oil development work.

Roeschlaub, H. M.—"Possibilities of the oil shale industry." *Eng. and Min. Jour.*, vol. 108, Oct. 4, 1919, pp. 572-576. Discusses the necessity for rapid development of the western shale fields and the general principles on which mining, retorting and refining will be based.

White, David.—"Regional alteration of oil shales." Abstracted in *Bull. Geol. Soc. Am.*, vol. 26, 1915, pp. 101-102. Paper before the Geological Society of America.

White, David.—"The unmined supply of petroleum in the United States." Paper before the Society of Automotive Engineers. *Automotive Industries*, vol. 40, Feb. 13, 1919, pp. 361, 376, 385. Estimates the amount of oil yet available in the ground, and discusses the rela-

tion of production and consumption and the possibilities of oil-shale development. See also *Nat. Petroleum News*, vol. 11, Feb. 12, 1919, pp. 23-24.

Winchester, D. E.—"Oil shale in the United States." *Econ. Geol.*, vol. 12, Sept., 1917, pp. 505-518.

Winchester, D. E.—"Oil shales." *Jour. Franklin Inst.*, vol. 187, June, 1919, pp. 689-703. Description of the occurrence and properties of the oil shales of the Western United States and discussion of the present status and possibilities of the industry in this country.

Winchester, D. E.—"Contorted bituminous shale of Green River formation in Northwestern Colorado." *Jour. Wash. Acad. Sci.*, vol. 9, May 19, 1919, p. 295; discussion, p. 295. Paper before the Geological Society of Washington. Brief discussion of the cause of the twisting of the laminae in a zone of rich black bituminous shale which is underlain and overlain by beds of laminated and uncontorted shale and sandstone.

Winchester, D. E.—"Oil shale in northwestern Colorado and adjacent areas." *U. S. Geol. Survey Bull.* 641, 1917. pp. 139-198. Issued as separate "Bull. 641F." Describes occurrence of oil shales in Colorado and Utah, with discussion of geology and results of distillation of numerous samples.

Winchester, D. E.—"Oil shale of the Uinta Basin, northeastern Utah, and results of dry distillation of miscellaneous shale samples." *U. S. Geol. Survey Bull.* 691, 1918. Pp. 27-55. Describes occurrence of oil shale in Uinta Basin, discusses geology and gives data on results of distilling numerous samples.

Winchester, D. E.—"Oil shale and its development in the United States." *Railroad Red Book*, vol. 36, Jan., 1919, pp. 21-26. Gives character, location and extent of shale deposits in the United States; discusses conditions affecting the mining of the shale and its delivery to retorts; gives list of distillation processes and names of companies most interested; and discusses the yield of by-products and costs of mining and retorting.

Wolf, J. H. G.—"Commercial aspects of the shale oil industry." *West. Eng.*, vol. 9, June, 1918, pp. 222-223. Discusses economic and commercial possibilities of shale oil industry.

Woodruff, E. G., and Day, D. T.—"Oil shale of northwestern Colorado and northeastern Utah." *U. S. Geol. Survey Bull.* 581, 1915, 21 pp. Describes occurrence of oil shales of Colorado and Utah; discusses and gives results of distillation analyses.

THE PROTECTION OF BARYTES.

The greatly increased use of lithopone as a base for paints, particularly for interior use, has stimulated the demand for barytes, natural barium sulphate, to such a degree that the supply cannot keep pace with the demand. Lithopone is an artificially prepared compound composed of about 70 per cent. barium sulphate and 30 per cent. zinc sulphide, precipitated together. Its most important use is in paint, but it is also used in oilcloth, linoleum, rubber goods, shade cloth, etc.

Prior to the war large quantities of barytes were imported into the United States from Germany, but during the war imports were negligible, American production increased very greatly and is still increasing. Ground bayrtes as used in paints was formerly regarded as an adulterant, but now it is generally recognized as a valuable paint constituent. While domestic sources have expanded rapidly they have not overtaken the demand and there is need for still greater expansion. Stocks are low, little being sold on the open market, and prices are high. Since barytes is a gangue mineral associated with metallic ores now being mined in the West, it is suggested that more attention be given to its recovery as a by-product.

Despite the increase in demand and the present healthy condition of the barytes industry, foreign competition is feared, and the producers have joined forces to seek tariff protection. An association known as "The Barium Producers and Manufacturers of the United States" was formed in December, with Maxmilian Toch as president. A tariff bill, introduced into the House of Representatives by Congressman Rhodes, and referred to the Committee on Ways and Means, provides for an import duty of $10 per ton on crude and manufactured barytes; on manufactured barytes or barium sulphate, $15 per ton; on barium carbonate, $20 per ton; on barium binoxide, barium chloride and every other barium compound, $20 per ton. At the request of the Ways and Means Committee the Tariff Commission has held several hearings of barytes producers and manufacturers of barium products in New York, Washington and St. Louis, in order to prepare information upon which a suitable rate of tariff may be based. The Commission is investigating the cost of mining and manufacturing of barytes and barium products, including lithopone, in order to supply this Committee with complete and authentic information.

Barytes in South Australia.

Before the war practically all of the barytes used in South Australia and New Zealand was imported, mainly from Germany. When this supply was cut off attention was directed to a large deposit of barytes near Noarlunga, South Australia, and a mine was opened here. It is said that the vein averages five feet in thickness and extends for a half-mile along the outcrop. Two shafts have been sunk to depths of 50 feet and 80 feet respectively, definitely blocking out 6,500 tons of ore. About 200 tons per month is now being produced, but enlargements, including the erection of a grinding and treatment plant to cost about $10,000, are contemplated. The total consumption of all grades of barytes in Australia is said to be between 4,000 and 5,000 tons per year. Japan is a large buyer, using about 3,000 tons per year, and is now importing some Australia barytes.

The ore as it comes from the mine is first sorted by hand into grades and sizes, and cobbed from adhering gangue by means of crutch-shaped iron tools. The cobbing is usually done in concrete reservoirs, with perforated iron or wooden bottoms, through which is run a strong flow of water. The clean material is dried, again graded by hand, and then coarse-crushed or sent direct to edge-runners for fine grinding. The product from the first edge-runner is transported to the mill by conveyors and passed, in succession, through two or three similar machines until the product is sufficiently fine. The color of the finished barytes is usually very good and does not require the acid treatment often used in the United States; but it has a slightly reddish or yellowish shade, which is "killed," during the grinding, with ultramarine. It is said that the machinery and equipment represents a capital of about $50,000. The mine employs 30 men and the crushing plant 12, with a total pay-roll of about $20,000 per year.

While the mine at Noarlunga is reported as the only producer of barytes in Australia, some fear is expressed that the Australian industry will not be able to compete with imports from Europe without a protective tariff. — From U. S. Bureau of Mines, Reports of Investigations, by R. B. Ladoo.

Note—There are two producing barytes mines with mills in Canada, that of Barites, Ltd., Lake Tinsley, Cape Breton, N.S., and the Premier Langmuir Mines, Ltd., Township of Langmuir, Porcupine Area, Ontario. The first-named is the oldest, while the latter company completed their mill in 1918. Other deposits of barytes in Ontario are in the Townships of Yarrow, Cairo, Lawson, Northern Ontario, Penhorwood, 150 miles northwest of Sudbury, Levant, in County Lanark, Portland, Bathurst, Oso, and North Burgess.

The Bicarbonate Reaction in Its Relation to the Manufacture of Carbon Dioxide*

A Discussion to the Requirements Necessary to the Successful Operation of this Reaction

By GEO. H. TOMLINSON

IT is estimated that something in excess of 100,000,000 pounds of liquid CO_2 are produced annually in the United States and Canada, principally for use in carbonated beverages, and yet the effects of prohibition in relation to the expansion of the soft drink industry are only now being felt. The growing industrial importance of this business is therefore evident. For this reason a discussion of the interesting cyclical process by which CO_2 is made should be of interest.

Practically all of the carbonic now supplied to the trade is manufactured from combustion gases. The CO_2, which they contain, is combined with an alkaline carbonate, thus effecting its separation from the others. The solution is then boiled to decompose the bicarbonate thus formed and the pure CO_2 is recovered. Briefly described, the process is conducted as follows:

The coal or coke used in its production is burned in the usual way under steam boilers, thus furnishing not only the raw material of manufacture, but also all the power required for its purification, and liquifaction. The flue gases leaving the boilers are first passed through an economizer to reduce their temperature and then through scrubbers to remove dust and sulphur dioxide. From these they go to an absorption system in which contact with an alkaline carbonate solution is effected and as much as possible of the CO_2 combined. The now carbonated lye is drawn from here and pumped through a heat regenerator, the purpose of which will be mentioned again. It is then passed to the economizer, and, following this, is used to condense the steam given off with the CO_2 during the final heating. Its temperature is thus raised to the boiling point, by otherwise waste heat alone. The "boiling off" is effected by utilizing the exhaust steam from the compressors, etc., which in a properly balanced plant is sufficient to maintain the necessary heat balance. The decarbonated or exhausted lye returns through the heat regenerator, giving up its heat to the carbonated lye, before again passing to the absorption system to renew the cycle just described.

The CO_2 which is liberated from the boiling bicarbonate solution is separated from the steam as previously noted, and after further cooling is compressed into the cylinders in which it goes to the trade.

From this description it can be seen that the two main objects to be accomplished for the successful working of the process are:

1. The recovery from the combustion gases of the maximum amount of CO_2 by bringing this into combination with the alkaline carbonate.

2. The maximum dissociation of the bicarbonate thus formed with the minimum consumption of heat.

Factors Determining Equilibrium of Reaction.

To permit of our stating the lines which must be followed if these objects are to be completely achieved, let us consider for a moment the factors determining the equilibrium of the chemical reaction involved.

It is recognized that the alkaline bicarbonates exhibit the phenomena of a gaseous or dissociation tension resembling in every way, in this regard, the similar properties of a solution of a gas in water. These dissociation tensions have been determined by Dibitts,[1] who shows that for the sodium salt they are as follows:

At	15°C.	120 m.m.
	30°C.	212 m.m.
	40°C.	356 m.m.
	50°C.	563 m.m.

For potassium bicarbonate the corresponding figures are much higher. Thus, at 15°C. the dissociation tension is 461 m.m.

In view of these considerations one would naturally expect that the bicarbonates would be much more unstable than they actually appear. That this is not the case is explained by the protective action of the thin layer of gaseous CO_2 which immediately forms over the surface, thus maintaining a partial equilibrium. If this CO_2 is continuously removed, however, as by passing air through the solution, dissociation proceeds. It is claimed that by this means a solution of bicarbonate can be completely resolved into the normal salt even at ordinary temperatures. The same action occurs, but more rapidly, of course, on boiling the solution. In this case the CO_2 is carried off by the steam.

The direction in which the reaction proceeds, at any temperature, therefore, must depend upon the pressure exerted upon the solution by the CO_2 gas itself. If the CO_2 pressure is higher than the dissociation tension of the solution and any normal salt is present, more bicarbonate will form. If the CO_2 pressure is less than the dissociation tension of the solution, bicarbonate will then revert to the normal salt.

In carrying out the process under discussion, we are dealing with various mixtures of bicarbonate and the normal salt. As a matter of fact, the proportion of bicarbonate may vary from about 30% to 75%. Throughout this range and for every degree of temperature the solution will therefore exhibit a series of definite and constant dissociation tensions. While these constants have never, as far as I know, been completely determined, we can safely assume that they must bear a specific ratio to the temperature, as well as to the relative proportion of bicarbonate present in the solution. That is, the higher the temperature and the higher the proportion of bicarbonate the higher will be the dissociation tension.

Conditions Necessary for Successful Operation.

Without going further into these theoretical considerations it now seems possible to deduce the general conditions which must be fulfilled for successfully operating such a plant.

Let us represent the pressure of the CO_2 in the combustion gases entering the absorption system by X, and the

*A paper presented at the Third Annual Convention of Canadian Chemists, held at Toronto, May 27th-28th, 1920, by Geo. H. Tomlinson, B.A., F.C.I.C., Research Chemical Engineer, Riordon Pulp and Paper Co., Ltd., one time Chemical Engineer, the Liquid Carbonic Co., Chicago, Ill.

[1] J. Prak, Ch. 3, X, 417, Vol. 10.

pressure of the CO_2 in the waste gases by X_1. Also let us represent the CO_2 tension of the exhausted lye solution by Y, and the CO_2 tension of the carbonated lye by Y_1.

The maximum amount of CO_2 will then be recovered from the combustion gases when X has as high a value as possible, and when X_1 has as low a value as possible. Also the maximum amount of CO_2 will be disengaged from the lye solution when Y_1 has as high a value as possible and Y has as low a value as possible. It can also be seen that Y_1 can never attain a greater value than X at the temperature at which combination occurs and X_1 can never attain a lower value than Y.

Now, X will normally have its greatest value when the percentage of CO_2 in the combustion gases approaches 20%, and Y will have its lowest value the more completely the lye is boiled and the lower the temperature at which absorption is commenced. Since the amount of heat available for boiling off is limited, if we are in practice to obtain the lowest value for Y, we must reduce the volume to be boiled to the minimum. For this reason the concentration of the lye solution used must be as strong as possible.

Having thus determined the maximum value for X and the conditions which will result in Y having its minimum value, the best efficiency we can hope to obtain will occur when $X=Y_1$, and $X_1=Y$. In other words, the curves X by X_1, and Y by Y_1 should coincide. This condition should obtain, or nearly so, when sufficient time is provided for the absorption, when it is conducted on the counter current principal, and when the amount of carbonate present is exactly adjusted to the amount of CO_2 available.

As a further consideration in connection with the above we have the fact that the value Y for a sodium bicarbonate solution is less than for a potassium bicarbonate solution, as Dibitts' figures show. For this reason the use of the sodium salt would seem indicated. This, however, has the disadvantage of being much less soluble than the other, so that high concentrations cannot be employed. A greater volume must, therefore, be circulated, and the boiling off can consequently never be so complete. By using a mixture of the two, however, this difficulty is avoided, and a more efficient solution can be provided than with either alone.

Accepting the above hypothesis it can be seen that with the numerical values of Y determined, then the other factors controlling the design and operation of such a plant can be computed. For example, the theoretical quantity of lye of any particular density required per pound of coke can then be calculated, the surface for heat exchangers, as well as the entire heat balance of the system can be estimated, etc. For this reason I set myself the task, some years ago of investigating these values. While their exact determination is attended with unusual difficulty, I eventually established their specific relations with sufficient accuracy to extend the application of these principals to practical use. The development of this phase of the subject is, however, quite beyond the scope of the present paper.

Theoretically, every pound of carbon burned should yield 3.66 lbs. of carbon dioxide. Nothing like all of this, however, can be recovered by the process described. As far as my experience goes, 50% of this yield represents efficient control, or something slightly in excess of 1½ pounds CO_2 per pound of coal or coke burned should be obtained. As a matter of fact there are probably few, if any, plants operating to-day in which this efficiency is realized, or even approached. In many of these auxiliary power is also employed, and, even then one pound of CO_2 per pound of coke is rarely exceeded.

That better results are not being generally obtained is probably due to the veil of secrecy which some manufacturers have endeavored to maintain in reference to this business. If I have, therefore, been able to indicate that any mysterious or secret quantities in connection with this process vanish when it is subjected to technical investigation, the industry, as a whole, may sooner or later benefit.

RESEARCH SCHOLARSHIPS AWARDED.

A. L. Marshall, B.A., graduate of the University of British Columbia, who has been doing research post-graduate work at Toronto University, has been awarded the 1851 Exhibition Science Research Scholarship. The annual value of the scholarship, which extends over two years, is £200 ($840), and the recipient can choose, with the ratification of the commissioners, the university he wishes to attend. Six years ago, Mr. Marshall had the honor of heading the list of 1,500 High School pupils, who wrote from all parts of Canada for entrance into the universities. He is 23 years of age. Mr. Marshall has left for England, where he will decide what university he will attend.

Production of Vanilla in the South Indian Ocean.

The production of vanilla beans in Madagascar and dependencies, including the Comoro Islands, and the islands of Reunion and Mauritius for the season 1919-1920, has been established as follows:

	Pounds.
Madagascar and dependencies:	
Comoro Islands	403,204
East Coast	423,503
Nossi-Be	110,230
Total	936,937
Mauritius	2,646
Reunion	198,414

Statistics just received by the Consulate from the Governor of the Seychelles Islands indicate that the vanilla production in that archipelago is estimated at 6,614 pounds of cured vanilla for the year 1919.

—U. S. Commerce Reports, March 19, 1920.

TURPENTINE FROM DOUGLAS FIR.

A company named the Douglas Fir Turpentine Company has been incorporated, with offices at 510 Hastings St., Vancouver, and is operating on Cortez Island, taking contracts to extract turpentine from Douglas fir in any neighboring locality. The process, which is patented, consists in boring holes in the tree and extracting the resinous sap, from which turpentine, resin, and other products are said to be obtained. The process is reported to be an improvement on other processes, including the German one.

CANADIAN COTTON INDUSTRY.

The total capital invested in the cotton industry in Canada, according to the preliminary report of the Dominion Bureau of Statistics on that industry for 1918 was $53,796,394. There are 26 cotton mills in Canada, distributed as follows: Quebec, 12; Ontario, 10; Maritime Provinces, 4. During the year the industry used 9,673,996 pounds of chemicals and dyestuffs, valued at $1,280,083. The total production for the year was valued at $66,399,228.

Explanation of Paint Fading

Relations Between the Fundamental Nature of Paint Materials and the Light Effects Obtained in Mixtures---Transparency Refractive Power and Fading

By J. R. MacGREGOR

TINTED paints are mixtures of two or more pigments and, contrary to the usually held ideas, these pigments with the exception of black are perfectly transparent. There will be no dissention from this last statement in the case of whiting, barytes, silica, china clay or asbestine, because anyone who has seen these pigments mixed in oil realizes such to be the case. In the case of lead and zinc pigments, however, the popular conception is that they are opaque. As a matter of fact, carbonate of lead and zinc oxide are just as transparent as silica or whiting. Thorpe's "Dictionary of Applied Chemistry," Vol. VIII, page 236, states of white lead: "Examined under the microscope it appears to consist of rounded, circular, or oval grains. The grains are transparent and vary in diameter from .0001 to .0004 of an inch." Zinc oxide is a white, transparent crystal. The reason these last two pigments are designated as opaque is because they deflect or refract light rays to a greater extent than the so-called inert pigments. The measure of this property is known as the refractive-index of that pigment or oil.

Relation of Light Refraction to Opacity.

It is the refraction of water that causes a long stick placed half in and half out of the water to appear bent at that point where it enters the water. Various materials cause light rays to be bent to a greater or less extent. Lead and zinc have the property of bending these rays more than any other pigments used in paint. On account of this when they are spread over a surface they cause the light passing through them to be bent to such an extent that the rays will be turned around and shot out of the film before they reach the surface underneath. Thus, a paint made with lead and zinc appears to be opaque because you cannot see through it. If these pigments were opaque it would never be necessary to use more than one coat as is the case with bronze and black paints, because these pigments do not depend on refraction of light; they are so constituted that light does not pass through them and are thus truly opaque. In white paint, on the other hand, the light passes through the pigment particles but the rays are bent to such an extent that they are returned out of the film before they strike the painted surface and therefore they cannot carry back to the eye the picture of what is lying underneath. If linseed oil had a high refractive-index, equal to white lead or zinc oxide, then the white lead and zinc oxide would not deflect the light ray passing through the oil, and the light would penetrate straight through the pigment particles and we could see on the other side, just as we see the surface underneath silica or whiting mixed with oil. Opacity of white paint is due to the difference in light refraction of the materials used.

Materials of Equal Refractive-Indices Give Transparency.

A vehicle can be made from piperine and arsenic iodide to have the same refactive-index as white lead.* When this is mixed with any amount of white lead, the white lead becomes transparent when placed in water. A mixture of white lead and this vehicle placed over a ruled paper allows you to see the lines on the paper as distinctly as though no white lead were mixed in the vehicle at all. This is because the vehicle has the same refractive-index as the white lead, and thus there is no deflection of the rays of sunlight, which pass through the vehicle and the pigment without changing their direction. However, if we mix our white lead with a vehicle that has a very different refractive index we get the light rays twisted so that they do not go straight through the film. Instead, they only go through a short way and then are turned without reaching the surface under the paint and we get the impression of opacity.

Thus mix white lead with linseed oil and our film is opaque, while if we mix silica with linseed oil our film is transparent, because silica and oil have practically the same low refractive-indices. If silica is mixed with a vehicle that has a high refractive-index the silica will appear quite opaque, while white lead mixed with this same vehicle will produce the unusual phenomenon of appearing transparent. .

The refractive-index between air and any of the pigments is much greater than between oil and the same pigments. Therefore, it follows that a coating of paint made from pigment mixed with oil will be less opaque than one made from pigment mixed with air, and it is common knowledge that two or three coats of lead in oil are required to hide a surface, whereas one coating of dry pigment, dusted on would obscure it completely.

The illustration we are all familiar with is the change in opacity accompanying the drying of calcimine. In wet calcimine when the light passes through water and the pigment, the refraction is very slight and the light rays pass in almost a straight line through to the surface underneath. However, when the water evaporates it leaves a coating of pigment and air on the surface, and the refraction between pigment and air is so great that the calcimine, which when wet permitted a view of the underlying surface, becomes opaque when air displaces the vehicle or media with which the pigment was originally mixed.

This same phenomenon appears when linseed oil disappears from around pigments in a paint film. In fact, it is exactly this phenomenon that causes fading of our light tints.

Relation of Fading to Refractive Power of Pigment.

Fading only appears after chalking has set in, and chalking merely means that the oil or binding material around the pigment particles has disappeared, leaving the particles adhering to the surface, but mixed with air rather than with oil, as was originally the case. This causes the white pigment in the chalked coating to have much greater obscuring power than it had in the original oil coating.

The more white material we mix with a tint, the lighter it will become. Now, if the oil disappears on the surface of a coating, we get exactly the same effect as if we mixed more white material with the colored pigment, because less light passes through to the colored particles, producing

*The writer is indebted to Prof. Merwin, of Geophysical Laboratories at Washington, D.C., for this special vehicle.

the same effect as an increase in the amount of white pigment in oil would produce.

If the above explanation is correct it follows that the only manner in which we can prevent fading of our paints is to get a vehicle that will not perish. Unfortunately, we have no such material at our command, and such being the case, we must adapt ourselves to the conditions as they exist. We must use linseed oil and pigment. I do not feel that we should use inert material such as barytes, whiting, or china clay, in tints, because these pigments when mixed with oil are perfectly transparent, but on the disappearance of the oil they become very opaque, the result being that greater fading will occur where these pigments are present. It seems the best scheme is to mix tinting material with the highly refractive or so-called opaque pigments. This will not prevent shades fading. We must realize that a perfect paint perishes by chalking, and when we get chalking in every instance we get fading. Some master painters advocate a small amount of kauri varnish in the last coat to retard chalking. I would not object to this, provided a good kauri varnish is used and in moderate amounts. However, great care must be taken to produce a soft film that will perish by chalking, and in this instance also fade rather than produce a non-fading, non-chalking coat that will perish by peeling.

I realize that in the past many master painters have been forced to repaint jobs because they faded. I feel that had these painters understood the cause of the fading they would realize that the fault was not theirs, but rather the fault lay with the customer in selecting the light tint.

Some people advocate the use of zinc oxide to prevent chalking. I must confess that I cannot agree with this statement because, under certain conditions zinc oxide changes chemically, forming water soluble compounds that cause paint to lose its gloss, and, therefore, to fade.

As stated at the beginning of this paper, I am not able to give a recipe to stop fading, but while we cannot prevent this trouble from occurring, I believe a closer explanation of the facts in the case will show a house owner that the paint or painter should not be held accountable for fading.

THE EAGLE-PICHER LEAD COMPANY.

Chicago, April 24, 1920.

PRODUCTION OF GLYCERIN FROM SUGAR.

Prepared by the Research Division, Bureau of Foreign and Domestic Commerce.

At the beginning of the war Germany was "swimming in sugar," to use an expression of the Frankfurter "Zeitung" (May 22, 1915). Production had been greater than ever; large quantities left from the previous campaigns were still available; exportation had stopped. One of the ten "war commandments," proclaimed on bills posted in all railway stations, advised the people: "Use plenty of sugar with your meals; sugar is an excellent food." Certain measures of the Government, however, soon made it impossible for the people to follow that advice, and sugar became scarce in the market, although it was known that stocks were plentiful, for the production of the 1913-14 campaign had yielded 2,715,870 metric tons of sugar. Germany had been the leading sugar-producing country of Europe, and yet the people suffered from scarcity of sugar during the war and were compelled to use honey and saccharin as substitutes. It was supposed that owing to the shortage of fats the Government was trying to conserve the stocks of sugar. It now appears that large quantities of sugar that had been withdrawn from human consumption were used in the manufacture of glycerin for war purposes. The process of production is described by Dr. W. Connstein and Dr. K. Ludecke in "Die Naturwissenschaften" (1909, p. 403).

Process of Production.

The consumption of glycerin in the manufacture of cosmetics and for other purposes, chiefly in the manufacture of explosives, increased enormously during the war, while the supply of the raw materials—fats—was constantly diminishing. It was therefore necessary to seek other sources, and sugar was selected, as its chemical structure is somewhat similar to that of glycerin. The transformation of sugar into glycerin was accomplished by the biochemical method. It had been known for a long time that in the ordinary fermentation of sugar with yeast small quantities of glycerin would be produced, amounting to about 3 per cent. of the sugar. By adding alkalis to the liquid in fermentation the production of glycerin was increased. It was found that almost any salt with an alkaline reaction could be used for that purpose. Experiments were made with acetate, bicarbonate, and dibasic phosphate of sodium and with carbonate of ammonia. The yield of glycerin was increased to 12.7 per cent., but the alkaline mash was found to be an excellent breeding place for all kinds of acid-forming bacteria, which would pollute the glycerin. This fault was remedied by the use of sodium sulphite, which acts as a poison to the bacteria of lactic acid and others, but does not, even in large quantities, affect the yeast cells (Saccharomyces). When sodium sulphite was employed as an antiseptic the yield of glycerin was increased proportionately to as much as 23 to 36.7 per cent. of the sugar.

The ordinary fermentation produces not only alcohol, carbonic acid and glycerin, but also small quantities of acetaldehyde. When the sulphite is added in increasing quantities the yield of acetaldehyde and glycerin increases, while that of alcohol and carbonic acid decreases. The acetaldehyde was used largely for war purposes. The production of glycerin from sugar had a great practical value in war time, according to German writers. The manufacturing process, patented in 1915, was exploited on a large scale, and the production of glycerin exceeded 2,200,000 pounds a month. The invention also possesses an unusual theoretical interest, as it shows how the transformation of materials by bacteria can be influenced by the addition of chemicals. In the words of a German writer (Prometheus, Nov. 1, 1919): "The biochemical processes open up new prospects for the future and seem to be destined to provide many substitutes to a people robbed of all raw materials."

Attempts made during the war in Austria-Hungary to produce glycerin from sugar do not seem to have met the success claimed for similar attempts in Germany. Complaint was made by the Bohemian journals of Prague that carloads of sugar had been wasted in recovering negligible quantities of glycerin, and doubts were expressed whether such waste of food could be justified even by the exigencies of war.—From the U.S. Commerce Reports, No. 28, p. 676.

BRITISH DYESTUFFS' REPORT.

The British Dyestuffs Corporation, in a recent report, announces that the profits for the year ending October last justify paying eight per cent. on the preferred capital, whereof £4,077,000 is issued, after paying seven per cent. on £4,106,000 preference capital. No dividends are announced on the £980,000 deferred.

INDUSTRIAL SECTION

Construction, Manufacturing and Market News

REVIEW OF BRITISH CHEMICAL AND ALLIED TRADES.

General Comparison of Conditions Obtaining in the United Kingdom in 1913 and 1919.

Continued from June issue.

Dyes.

The larger dye firms manufacture both intermediaries and dyes in large quantities, but the methods used are more akin to specialization than quantity production, the same plant being used in rotation for the manufacture of allied products in bulk.

The personal efficiency of the worker is very important in dye manufacture, due to the fact that only by following carefully well-known lines can the product desired be produced. It is thus easier to check the workmen by the results obtained, since carelessness or failure to carry out the process in detail may result in a totally different product being obtained, or an unremunerative yield. The fact that the dye industry is a new one in this country and that the home demand is in excess of the production, makes it unnecessary for long credit to be given, and this is general throughout the world, due in a large measure to the shortage of dyes.

The importation of dyes has fallen tremendously in 1919, as compared with 1913; this, due partly to import restrictions, but chiefly to the large increase in the production of dyes in the United Kingdom. In 1919 the imports were only about 15 per cent of those of 1913. The importation of natural indigo, which is of special interest, as it is one of the higher class of dyes which are difficult to manufacture, shows a gradual fall during 1919, due to the increase in production of the synthetic and also to the fact that shipments of the natural indigo usually arrive in this country during the first half of the year. More important, however, is a comparison of the imports of the synthetic indigo in the years 1913 and 1919, and this shows that the importation has decreased to about 10 per cent of the pre-war imports. This is in a large measure due to the successful efforts of Messrs. Levinstein, Ltd., at their Ellesmere Port Works, which were formerly owned by Meister Lucius and Bruning, in order to comply with the English Patent Regulations.

The export of dyes has increased during 1919 when compared with 1913, but this increase is not great, due to the restrictions and large home demand.

The home trade demands for dyes is exceptionally strong, and, with the exception of a few of the commoner dyes which were easily manufactured, is in excess of the supply. The price of dyestuffs is high compared with pre-war prices, and, generally speaking, only shows a tendency to fall in the dyes of which there is a plentiful supply. Production of dyes has increased enormously since 1914, and this is readily seen by comparing the importation of dyes for 1913 and 1919.

In 1913 the import of coal tar dyes exceeded the export by nearly 16,000 tons. In 1919 the imports were over 1,500 tons less than the exports.

It is confidently hoped by United Kingdom manufacturers to continue the increase of production at a rapid rate now that many difficulties have been overcome, and much valuable experience gained which should facilitate the speedy erection of future plants and successful working of the same.

Many difficulties had to be overcome, and the chief was with chemical plant. Suitable plant for the manufacture of intermediates was practically only obtainable from Germany in 1914, and autoclaves were not manufactured in this country. One of the most difficult tasks that had to be faced by the plant manufacturers was the rendering of the plants resistant to the high concentration of acids used. The tiles and acid proof cement used in many dye plants are not perfect yet, but improvements will no doubt result from the information collected by the members of the Department of Overseas Trade Mission sent to Germany to visit dye works. Enamelled linings have been the cause of constant trouble but are improving; they are, however, being replaced where possible by tile and cement linings which are easily renewed. The general working costs have been high as a result of the excessive wear and tear on inferior plants and the high cost of labor. These costs should decrease as experience is gained and better plants become available. The dye industry, like the chemical industry generally, has not been troubled with strikes, all demands of labor having been met by arbitration. The dye industry, especially on its intermediate side, is in a good position with regard to skilled labor, due to the fact that stuffs were retained during the war for the manufacture of explosives. The plants on dye works were kept in repair during the war in order to keep up a continuous supply of explosives, and they were thus in a fairly good state of repair at the transition period. The larger plants are, generally speaking, laid out on sound economic lines, although in one or two cases money and valuable time have been lost due to erection on an unsuitable site with consequent dismantling and re-erection.

The export of dyes at the present time is exceedingly difficult, due to:

(a) The necessity for obtaining licences for all colors exported.

(b) The excessive home demand.

The demand for dyes is probably the greatest that has ever been known, but owing to export difficulties only a fraction of the overseas requirements is being met. The Chinese and Indian markets offer an unlimited field for export, and nearly every other country require dyes of some kind.

The only competition existing at the present time is in the common colors easily manufactured. This is due to the fact that the German dyestuff production is at the present time about 20 per cent of the pre-war amount, and the only other countries manufacturing dyes in quantity

are the United Kingdom, Switzerland and America, the Japanese dyestuff industry having practically ceased to exist, chiefly due to the lack of raw materials (coal-tar) and trained chemists.

There is no organization in the dye industry other than the amalgamation of Levinsteins, Ltd., and British Dyes, Ltd., to form British Dyestuffs Corporation, Ltd., who have pooled their interests with a view to increasing their production.

The future position with regard to the export trade is doubtful.

In the not very far distant future the German dye manufacturers will be able to produce a large percentage of their pre-war output. The problem will then be one of exceedingly keen competition, especially in the colors which are difficult to prepare. In pre-war times the Germans supplied the higher class vat colors on condition that the purchaser took other colors less difficult to prepare, and if this policy is followed in the future it will influence the whole of the dye trade. It is therefore imperative that the manufacture of highly specialized dyes should be extended in this country as soon as possible.

The success of the British dye industry (without the aid of protective measures) would appear to depend on securing a firm hold in overseas markets.

EXPLOSIVES.

General Position, 1919, Contrasted with 1913.

The trade received very critical attention during the war and, speaking generally, for the trade as a whole, it is continuing to operate on progressive lines. It realizes that foreign competition can only be successfully countered by perfecting its organization in every direction.

As far as can be estimated the figures of consumption for 1919 show that, compared with 1913, there will not be a very great difference in total quantity, but it will probably be found that there has been a considerable transference of trade from the Blasting Powder to the High Explosives Section. The great demand for coal, quarry work in connection with housing, and the resumption of necessary public works should stimulate the future demand considerably. The quantity of explosives used in collieries seems to have increased although, from various causes, the coal output has decreased.

The export trade has declined through the prohibition of exports to neutral markets during the war. Competition is now keen, and it is unlikely that continental demands will make up for trade lost in the Far East and in South America. Developments in such countries as China and Russia may in time have an effect, but it seems to be fairly certain that, with respect to explosives, the source of supply must be as near as possible to the consumer. This is emphasized by the fact that some of the sources outside the United Kingdom, nearer to consumers, command very much cheaper labor than can possibly be obtained here.

It is not easy to find new uses for explosives. In some foreign markets agricultural demands can be developed. On the whole, however, the prospects are quite good, because through the wastage of war there should be for years a big demand for coal and minerals of all kinds involving the use of explosives. As explosive factories were much increased in capacity to meet the war needs of propellants, there is to-day easily an excess power of production. There are very few commodities which advanced less in price during the war than mining explosives, the advance in which is estimated at an average of 70 per cent compared with pre-war rates, and notwithstanding the comparatively high cost of materials and wages, it is expected prices will be reduced.

The labor position in 1913 presented no special difficulties, and the bulk of those employed were on industrial explosives rather than explosives for war purposes. At the termination of hostilities the demand for industrial explosives was below the pre-war level, and it was impossible to absorb the labor employed on explosives for munitions, even excluding National factories. Labor was consequently set free, but the demand for industrial explosives is now approaching the pre-war level. The explosives and its allied chemical industries have therefore had no appreciable difficulty in obtaining labor to meet requirements. The conditions of employment in the explosives industry are necessarily of a special nature. The policies of the trade unions have conformed essentially to those defined by the Labor Party in agreement with the Ministry of Labor, as to rates of pay, hours of work, etc. The reduction of the standard week from 50 to 47 hours has been arranged.

Railway delays are felt in the explosives business as in others. As regards the transport of both raw materials and finished explosives, it is of particular concern to this industry that the congestion at the docks and on the railways should be cured, as special storage conditions are necessary, limiting the quantities in stock. The question of the use of canals and waterways as an alternative method in inland transport is unimportant to the explosives trade.

The need for the plant in the Explosives and Chemical industries during 1919 has been relatively small. Pre-war plant has been maintained, if not actually operated, throughout the war, and the cessation of hostilities set free plant in some cases suitable for this section of industry. Where this was the property of the Government the Disposals Board took charge of it. The difficulties of getting supplies of new and special plant has been emphasized by the trouble experienced in obtaining even minor items of machinery. Conditions are now improving in this respect.

The supply of raw materials in 1913 was stable, supplies coming from all parts of the world, including an appreciable proportion from Germany. The effect of the war was both to cut off supplies (*e.g.*, potash salts from enemy countries) and to create a much greater demand for some raw materials (*e.g.*, acetone) than could be met by other sources of supply. To overcome these difficulties, substitutes (*e.g.*, sodium salts for potassium salts, alcohol ether for acetone) were used, and these in the main are still employed though a reversion to the use of potassium salts may soon be possible.

As to the raw materials still imported into the United Kingdom, the terms of the Peace Treaty, the possibility of a Tariff and Colonial Preference policy, with the existing and future exchange fluctuations may influence the conditions of import (*e.g.*, in the case of pyrites, sodium nitrate, cellulose from cotton, etc.), consideration of the development of new processes (*e.g.*, nitrogen products from the atmosphere), and the full use of the products of the Empire, would appear to depend on the foregoing conditions. A state of flux, and the large stocks of essential materials held by the Government have prevented stability

being reached in prices of raw materials during 1919. On the whole, there has been no serious shortage.

Ocean freights are high and very often difficult to obtain, so much so that, when an opportunity is offered, manufacture has often to be rushed; this has a detrimental effect on the cost of production and on employment generally.

As regards credit, the chief difficulty is what to do with regard to the Continent.

In the explosives industry, which is a key industry, it is considered that the United Kingdom can take care of any legitimate competition (*i.e.*, from countries where the labor conditions are in any way equal), but that the industry would be prejudiced if, for example, Germany unloaded any stocks that might be available, with the Mark exchange at its present level. It would appear to be the purpose of the explosives trade to continue and develop further all sections of what is known as "Welfare Work."

By research and cheapening of manufacture, without reducing wages, and by visits of special representatives to develop the markets of the world, as has already been done to a considerable extent—the explosives trade expects that it will not only contribute to its own prosperity, but also be of benefit to United Kingdom trade in general.

Oils, Fats, Soap, Candles, Etc. (Excluding Petroleum and its Products).

Raw Materials.—The principal factors influencing the supply of raw materials in 1919 were lack of transport and high shipping freights. A large development has taken place in the oil industry, which has met the situation imposed during the past years of war. There has been no marked shortage of oil nuts, etc., and the future outlook is hopeful. Prices are high compared with the pre-war period.

The position as regards exports is brighter. Where marked fluctuations appear, the cause can be usually traced to such influences as railway and labor difficulties, and the release of stocks which had been previously controlled.

The demand on home trade accounts is very high and the opinion expressed in many quarters by large manufacturers is: "We have as much as we can cope with meeting the home demand, without troubling at present to extend our export trade."

Prices during 1919 fluctuated very much, and at present, though high, are steady. Prices are not likely to decrease to any extent until there is a general fall in prices.

Production compared with the pre-war period is steadily increasing; this is true when considering the oil seed crushing industry. Before the war raw materials used in this country went largely to Germany and Austria, from which countries the expressed oils were exported to the United Kingdom and other markets. When war broke out the German market ceased to exist and supplies of oil nuts were diverted to this country and crushed in the Hull and other districts. This industry is now very important to the soap-making, margarine, paint and other home industries. Overseas demand is steadily increasing, but there is also a tendency in countries abroad to manufacture on the spot, where raw materials are readily available.

Paint Industry.

Raw Materials and Pigments.—The most important raw materials in this industry are barytes, white lead, white zinc and lithopone. With regard to barytes, supplies were obtained before the war from Germany and Spain, but the natural deposits in the United Kingdom have been developed in recent years to meet home requirements to a large extent. The supply of lead pigments has been short owing to the metal itself being required for munitions. With regard to zinc white the industry has been largely developed. This industry ranks as a key industry and keen competition from abroad may be expected. In the paint trade many large manufacturers have amalgamated with the object of facilitating the distribution of their manufactured products in the home and export markets. There is likely to be an increased demand for all products for export and if foreign markets are developed by organized trade representation, the outlook would appear to be decidedly cheerful.

Note on Exports and Imports for Chemicals.

Exports.—The vast difference between the exports of Superphosphates in 1913 and 1919 is due to the fact that, owing to the difficulty of obtaining supplies of phosphate rock due to shipping difficulties, it has not been possible to allow the free export of superphosphate, which has been badly needed here for fertilizing purposes. Similar differences will be noted in the case of Basic Slag, home demand being the predominant consideration in controlling the export. The similarity in the movements is no doubt due to the fact that the demand is a seasonal one, the exports in both years rising to their maxima between July and September.

The upward bound in April for Sulphate of Copper is no doubt due to the demand in France and Italy for this chemical for the spraying of the vines. The drop in the exports for 1919 is due in part to the fact that a good many vineyards in Northern France and Italy were destroyed during the war, and the demand for copper sulphate was not so great, and also in part to the increased production of copper sulphate in Italy. It will be observed that there is a striking resemblance in the figures for the export of Bleaching Powder for 1913 and 1919, which would appear to show that the usual channels abroad are being supplied, but that the quantities are not so great. On an average, the exports of Soda Ash and Saltpetre (British) for 1919 are greater than those for 1913. The export prohibition on Carbolic Acid was removed soon after the Armistice (November, 1918), and the large exports for January, 1919, are no doubt due to the accumulated stocks that were no longer required for the manufacture of explosives. The exports of the rest of 1919 were below those for 1913.

Imports.—Phosphate rock is badly needed here for the fertilizer industry, and the import in the early part of the year 1919 was high. The rock is mainly imported from Algiers (French Africa), but apart from shipping difficulties the action of the French Government in imposing a restriction on the export of the rock from Algiers caused the imports into this country to fall off considerably, although some recovery is noticeable towards the end of the year.

The figures for nitrate of soda show that the imports for 1919 were extremely low, this being due to the high price asked for this fertilizer. As the price fell and became competitive with that charged for sulphate of ammonia (the chief nitrate substitute) the imports began to rise, reaching their maximum in December last.

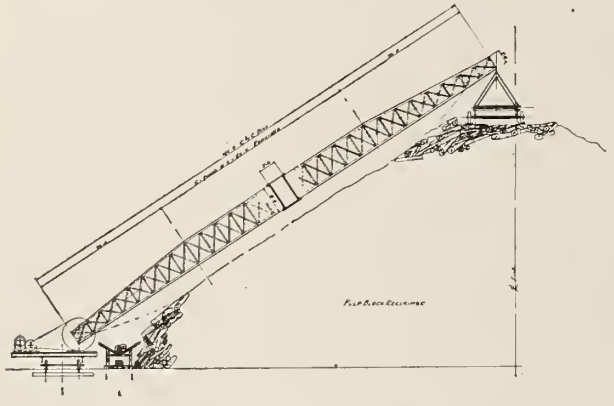
Conclusion.

The Chemical and Allied Trades in common with others have suffered from the upheavals of the old-established customs. It is probable that many of the disadvantages under which United Kingdom traders have endeavored to carry on will automatically disappear, as and when conditions reach the normal.

THE PULP-WOOD RECLAIMER.

The Pulp-wood Reclaimer is a machine for handling pulp-wood blocks from storage and is being put on the market by Canadian Reclaimers, Limited. As most of the mills store the wood in big piles for winter use and take the blocks from the pile by hand, this machine is a decided labour-saver as it drags the wood into a conveyor doing the work of quite a number of men. Taking this into consideration and also the labour situation with regards to the class of men required for this heavy work, the Reclaimer will effect quite a considerable saving in the cost of handling winter wood. The machine is capable of delivering 40 cords per hour into the conveyor.

The main principle in the designing of the Reclaimer was to retain the angle of repose of the pile, so that the blocks would come into the conveyor as needed. Accomplishing this, the machine, as shown by the above sketch, was designed with a bottom carriage running on a portable track on the ground. Connected to this carriage is a boom lying at approximately the angle of repose of the pile with its upper end resting on the crest of the pile on a small truck. This boom by means of idlers carries chains which drag down the slope of the pile and pull the blocks into a portable conveyor at the base of the



New Wood Reclaimer.

pile. The chains have pointed attachments set at such an angle that they will engage the wood and start it in motion. The sag in the chains makes it possible to dig a swath from 4ft. to 8ft. in depth into the storage pile. After the chains have dug to their capacity, the Reclaimer is moved laterally along the pile and the dragging continued until the full length of the pile has been covered, the boom is then shortened and the machine is moved back along the pile dragging as it goes.

By thus taking the wood from the face of the pile rather than from the bottom, it means the systematic handling of the blocks. It also eliminates the dangers due to slides which are a serious problem when the angle of repose of the pile is broken.

At pulp and papermills and also at rossing mills when they have no stackers the Reclaimer can be used for that purpose and when put in use as a stacker, it is built up as it makes the pile. By the time the wood is all stored in the fall, the machine is in place to be used as a Reclaimer. When used to stack wood it again cuts the cost considerably over some of the present methods of operating.

Many pulp and paper engineers have endeavoured to design a machine that would handle this wood mechanically, but to date this is the only one that has taken all the factors into consideration and that on trial has proven to be practical. The men who have become associated in perfecting this machine and putting it on the market are: R. W. McKenzie, W. C. Soubliere, T. Linsey Crossley who are Engineers experienced in the pulp and paper industry and E. A. Kemp, A. E. Marks, W. J. Boyd, financial and business men, all of Toronto.

BOOK REVIEWS

"STANDARDS & TESTS FOR CHEMICAL REAGENTS."

By Benjamin D. Murray. D. Van Nostrand Co. 385 Pages. Price $3.00.

Stories are often told where even a chemist, after a series of otherwise faultless experiments has suddenly realized that his reagents were not beyond question, or that he at least was not sure of them. Members of other professions are usually excused from responsibility on this score.

Chemists can do much to build up the fine chemical industries by checking up reagents continually. One wretched experience is generally enough to convince most laboratory heads that it actually pays to check up the chemicals received.

For those wishing to safeguard their analytical work, a reference of this kind should prove very useful.

In all cases, the methods of testing outlined are sufficient in number and fairly specific. The book seems complete in the number of reagents listed, and its constant use and introduction should tend to put a keenness into much of the analytical work now turned out which at times is sadly needed. Anything that impresses in a real way what is meant by C. P. in best practice, and what the limits actually are in the production of fine chemicals, should prove valuable indeed to the work of a vast majority of our laboratories.

BULLETINS AND CATALOGUES RECEIVED.

A unique and original departure from the prevailing type of house organ has been made by Prescott & Co., Oswald Street, Hulme, Manchester, England. As a supplement to their Index containing lists and descriptions of their products, they issue twice a month a booklet entitled "The Triangle," which is, in reality, a miniature magazine, the literary contents of which are directed mainly to the boys of the family. The object of the firm is apparent, as they state in the first issue of "The Triangle," it being the Invasion of the Home Paterfamilias, who is a user of chemicals, refreshes his mind on the question of prices, fills in his orders, and passes "The Triangle" over to the future users of chemical products. "When the boys have exhausted the literary contents of our house organ they will inevitably turn to the trade list and ask "What is this and what is that and what are they used for?" states "The Triangle," and we believe they are right. The Index is a remarkably fine piece of work from the standpoint of engraving alone, commencing with Food Colors, Essences, Essential Oils, and continuing through Benzoic Acid, Phosphoric Acid, the new sulpho detersive "Puropal" Brand for dyeing, etc.; and ending with the several chemicals made by this company.

Government Publications

By S. J. COOK

Department of Mines—Mines Branch.

Bulletin No. 27. Results of forty-one Steaming Tests conducted at the Fuel Testing Stations, Ottawa, by John Blizard, B.Sc., and E. S. Malloch, B.Sc.

Nineteen samples of fuel, eighteen being coals from the Province of Alberta,, and one, peat, from the Government Peat Bog at Alfred, Ont., were examined in the course of the investigation. Chemical analyses were made under the direction of Mr. Edgar Stansfield, and included both the examination of the fuels used and of the flue gases produced. All the trials described were conducted in a Babcock and Wilcox water tube boiler having 677 square feet of heating surface. One set of trials was conducted at a normal rate of steaming on a grate area of 23 square feet, with an air space of one-quarter inch between the bars; the second set was also conducted at a normal rate of steaming, but the grate area was 21 square feet, but the air space between the bars was one-half inch; the third set used the same grate as the second, but a higher rate of steaming.

The results of the trials are shown diagramatically and give data on the following points:

(a) The quantity of fuel burned to generate 1,000 pounds of steam from and at 212 degrees Fahr.

(b) The amount of ash, clinker and refuse removed while generating this amount of steam;

(c) The fraction of the total solid refuse which was withdrawn by cleaning and slicing above the grate bars;

(d) The difference in draft pressure below the bars, and in the flue leaving the boiler.

Geological Survey—Maps.

No. 1757. Molybdenite Deposits exposed on lots 9 and 10, range vii., Onslow Township, Pontiac County, Quebec.

No. 1758. Galena-Calcite veins on lot 22, con. vi., Fitzroy Township, Carleton County, Quebec.

No. 1759. Iron Ore Deposits exposed on lots 21 and 22, range 11, Bristol Township, Pontiac County, Que.

No. 1705. Thetford, Megantic, Wolfe and Frontenac Counties, Que. Scale, 4,000 feet to 1 inch.

No. 1739. Portions of Bristol, Onslow, McNab, Fitzroy and Torbolton Townships, Quebec and Ontario. Scale, 1 mile to 1 inch.

Explosives Division.

Annual Report for the Year 1919. By Lt.-Col. G. Ogilvie, Chief Inspector. 45 pp.

On May 14, 1911, the Minister of Mines introduced in the House of Commons at Ottawa a bill intended to provide for the control of explosives in Canada, but it was not until June 12, 1914, that it was passed, and then owing to the war it was not put into effect until March 1, 1920. To administer the Act, a new division of the Mines Department was created, and Lt.-Col. Ogilvie, who had become well known in this country through his connection with the Imperial Ministry of Munitions, was made Chief Inspector. Concurently with this appointment, Mr. J. G. S. Hudson, who for many years had been associated with the Mines Branch in connection with coal mining and explosives work, was transferred to the new division. Dr. A. E. MacIntyre, formerly of the Quebec and, later, the Lindsay arsenals, was transferred from the Department of Militia and Defence, and Mr. G. B. Frost, B.A., formerly inspector and chemist in the service of the I.M.M., was added to the organization staff.

The report is the first from the new division, and is in the nature of a historical review to which is added a number of appendices giving in detail the Orders-in-Council relating to the Act, and, in addition, the wording of the Explosives Act itself.

Department of Trade and Commerce—Dominion Bureau of Statistics.

Annual Report of the Trade of Canada for the year ending March 31, 1919. 1,000 pp.

This annual report is the first detailed statement of trade covering the whole period of the war. It is a book of a thousand pages and its contents were prepared by the External Trade Division of the Bureau from returns supplied by the Department of Customs. Every detail of Canadian trade for the fiscal years 1915-1919, inclusive, is shown.

The main tables of the report give details of the trade under every item of the import and export trade classifications for the past five years, every country of origin or destination of goods being shown. The items are grouped according to the classification in use in the Bureau up to the fiscal year 1919, so that this annual report corresponds in arrangement with the monthly reports issued during the period covered.

Department of the Interior—Surveys Branch.

Annual Report of the Topographical Surveys Branch. 1917-18. 41 pp.

A review, subdivided to show Field Work and Office Work, of the surveying carried on by this Branch during the year reported. The expenditures during the year, by reason of the rigid economies observed, amounted only to $657,000, though there was voted a sum of $776,300, which was $200,000 under the vote for the previous year for this work. Details of the surveys made are noted.

Department of Health—Food and Drug Laboratory.

Bulletin No. 435. *Currants.* 6 pp. 30 samples out of 111 examined were found to be raisins and not currants at all, so the Chief Analyst in his report on the subject points out that the vendors of these 30 samples are liable for prosecution under the clause in the Adulteration Act, which makes it an offence to offer for sale or to sell any article under any name which does not properly belong to it. The price of currants has soared so high that the grocers have seized on the opportunity to sell raisins of small size grown in California as Grecian currants.

A note in this same bulletin points out that there is no such thing as a wine or brandy which does not contain alcohol and that the term "Unfermented Wine" is a misnomer. It is proposed to consider such products as the port wines and sherry, which have no alcohol in them, adulterated under the Act. Many will see in this the hand of justice descending upon the inventors of near beer and its relatives.

Department of Mines—Mines Branch.

Annual Report of the Mineral Production of Canada for the Year 1918. 80 pp.

This report appears this year in much smaller form than usual due, according to the letter of transmissal, to the press of other work which has, during the past year, been laid upon the chief of the division in which it is prepared. There are, however, tables showing the production (quantities sold or shipped) of the mineral products in Canada during the year reported, the division

being made into metalliferous and non-metalliferous products. The total value of the mineral production for the year is given as $211,301,897, which is 11.4% higher than the value of the production in the year previous, and in point of value is the highest on record. The report shows production by Provinces and a series of tables and explanatory notes deal with the individual products separately.

Annual Report of the Department of Mines, for the Calendar Year ending December 31, 1918. 225 pp.

The activities of the several divisions of the Mines Branch are chronicled in this bulletin and make very interesting reading. There are reports from the Divisions of Ore Dressing and Metallurgy, Fuels and Fuel Testing, Metalliferous Mines, Non-Metalliferous Mines, Chemical Laboratories, Mineral Resources and Statistics, Ceramics, Road Materials, and the Library. Special reports are given regarding limestone, mica, graphite, sands and sandstones, rock salt, and pyrites. Twenty pages are given to reviewing the situation in regard to lignite carbonization, upon which much work has been done in the Fuel Testing Division. Every report is replete with the data gathered on its subject during the year, the analyses being in good detail. The subject of good roads, which is being so much discussed lately, is included and considered in a 25-page review of the work done. One thing that will strike the reader who is well-informed regarding the exodus of technical men from the service of the Dominion Government is the number of names of men prominent in their several professions who have already left the Department and who, as a consequence, will not be making reports of this nature for the Government next year.

Department of the Interior.

A Resource Map of Canada, scale 100 miles to inch indicating natural resources, transportation and trade routes.

Dominion Water Power Branch.

Water Resources Paper No. 2. 345 pp. 48 illustrations. 24 plates. 5 maps. 33 plans. "Bow River Power and Storage Investigations." By M. C. Hendry, B. A. Sc.

It is shown that it is economically feasible to regulate the flow of the Bow River so as to warrant development at six power sites of over 45,000 continuous wheel-horsepower all within 50 miles of the City of Calgary. From the natural flow, only 19,785 w.h.p. can be developed; but when storage basins are built and the water flow regulated and conserved, 48,175 w.h.p. will be available.

The report is well illustrated and is a considerable contribution to the knowledge of conservation of water powers in Canada. There are included a number of appendices by engineers of note, which deal with various special phases of the subject.

Water Resources Paper No. 7. 215 pp. 34 plates. 57 illustrations. Manitoba Water Powers. By D. L. McLean, S. S. Scovil, and J. T. Johnston.

The present report deals with the physical features of the water powers within the province of Manitoba. It shows that the power possibilities of the smaller rivers are limited and of local importance only, but the Winnipeg river, Grand Rapids on the Saskatchewan, and the large rivers of the north, including the Churchill, Nelson, and Berens have enormous possibilities as sources of power. Of the eight possible power sites in the province the report shows that three are now under development representing a total power development of 199,000 24-hour horse-power.

Department of Mines.

Geological Survey. Memoir No. 115 Geology of Matachewan District, Northern Ontario. By H. C. Cooke. 57 pp. 5 figs. 1 map (No. 1793.)

The present reports deals with the geology of the district in all its phases, and shows that the internal structure of the ore-bodies have been formed by the alteration and mineralization of the country rock by solutions coming up along a central vein. The partial calcitization of the feldspar of the pegmatite indicates a change in the character of the solutions during the formation of the ore-bodies. The discovery of a number of ore-bodies of all sizes and degrees of richness is recorded. Development work is still being carried on. Deposits of barite in commercial quantity were found, although it is pointed out that the distance from the market will probably prevent its immediate development. Fluorite and iron were also found.

Memoir 117. Geology and Ore Deposits at Ainsworth Mining Camp, B.C. By S. J. Schofield. 69 pp. 12 maps. 3 plates. 6 Figs

The report now under review open with the following statement: "Historically, the country in the vicinity of Ainsworth is one of the most interesting in British Columbia" Another quotation perhaps conveys as much information about the contents of the report as any words of the reviewer's could: "The field work in connection with this report was not confined to the actual mining camp at Ainsworth, but, in order to solve the problems which demanded attention, the region to the north and south was examined with the result that the formations in Ainsworth and around Kaslo have been correlated. A study of the geology of the walls of the trench from Kaslo as far south as the International Boundary and new information has been collected which bears on the origin of the Purcell trench, as the valley containing Kootenay lake is called."

Department of the Naval Service.

Quarterly Bulletin of Sea Fisheries Statistics. January-December, 1919. 11 pp.

Although this bulletin is called a "quarterly" it really gives data regarding sea fisheries for the entire calendar year. In order, according to the values of the sea fish caught and landed, the Provinces rank as follows: British Columbia, $15,216,397; Nova Scotia, $10,720,471; New Brunswick, $2,547,946; Quebec, $1,967,349; Prince Edward Island, $895,921.

Department of Trade and Commerce.

Dominion Bureau of Statistics. Monthly Bulletin of Agricultural Statistics, March, 1920.

Average yields of field crops for decennial periods, for Canada and each of the Provinces, farm reports from the experiment stations, agricultural wealth of Canada, and prices.

Fisheries Statistics of Canada, 1918. 119 pp. and 66 pp.

This report issued by the Dominion Bureau of Statistics. The statistics deal with the quantity and value of the catch and of the marketed product, the number and value of vessels, boats and gear, and the operations of fish canning and curing establishments.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Dyeing Composition.

Wm. A. Ainsworth, 199465, April 27, 1920. Three ounces of powdered dye are thoroughly incorporated with five pints of glycerine and diluted with six gallons of alcohol.

Purification of Hydrogen.

E. K. Rideal, 199453, April 27, 1920. CO is removed from H by mixing the gas to be purified with steam, passing the mixture over a heated catalyst, cooling the mixture and mixing it with air or O, then passing it over a second catalyst maintained at a lower temperature than that of the first catalyst.

Process of Dyeing.

Anton A. Gehrlein, 199516, April 27, 1920.

Apparatus for Producing Charcoal.

J. S. Pearce, 199570, April 27, 1920.

Recovering Sulphur Dioxide.

Hugh Moore, and Geo. A. Richter, 200396, May 25, 1920. SO_2 is recovered from the gaseous products of combustion of a sulphur bearing material by absorbing or dissolving it in an oil and then extracting the SO_2 from the oil.

Outlets for Acid Receptacles.

de Jahn, F. W., 200410, May 25, 1920. An acid receptacle, having a refractory lining and provided with an opening, has an outlet pipe attached to the receptacle, having a portion extending within, but spaced from the wall of the opening, and another portion projecting outwardly and provided with an attaching flange at its outer end.

Handling of Nitrosyl Sulphuric Acid.

Olaf Jensen, 200430, May 25, 1920. The destructive effect of nitrosyl sulphuric acid on iron is eliminated by adding to the acid a small quantity (less than 1%) of HNO_3.

Processes of Bleaching.

Jos. F. King, 200097, May 11, 1920. Material to be bleached is boiled in a solution of NaCl, Na_2CO_3, H_2O_2, KOH (NaOH) and Na_2SO_4, and the bleached material is rinsed. A soluble coloring substance may be added to the rinse water to color the bleached material.

Bleaching Compound.

Jos. F. King, 200098, May 11, 1920. A bleaching composition of NaCl 10 parts by weight, KOH 10, Na_2CO_3 10, H_2O_2 6 and Na_2SO_4 24. The KOH and Na_2CO_3 are used as detergents and may be omitted.

Charcoal.

Jno. S. Pearce, 199571, April 27, 1920.

Process of Producing Charcoal.

Jno. S. Pearce, 199572, April 27, 1920. Products of combustion are passed through an incandescent refractory material and then through a mass of wood, the volatile products and the products of combustion originally introduced are drawn off.

Separating Nickel and Copper from Mattes.

R. C. Stanley, 199647, April 27, 1920. Cu-Ni matte is smelted with an alkali sulfide (Nitre-cake) in a cupola furnace; material high in Cu (tops, reverts, etc.) is added and the molten sulfides ore charged into a reverberatory furnace to settle the Ni, come Cu and the precious metals going to the bottom. The layers are tapped off separately, the Cu being blown in a converter to blister Cu, the Ni is allowed to solidify to separate out Na and Fe sulfides, the Ni bottoms are again smelted with Nitre-cake. The product is then crushed and leached to remove Na and Fe, the purified sulfide is converted into the oxide, which is then reduced to metallic Ni melted and cast into ingots to be used as anodes.

Electrolytic Cells.

H. W. Matheson, 199333, April 20, 1920. A cell for the oxidation of Hg comprises a flat, shallow pan forming an electrode and a cathode having gas passages there through substantially covering the bottom of the cell and insulated therefrom. A stirring device removes oxide from the surface of the Hg.

Electrolytic Cells.

H. W. Matheson, et al, 199244, April 20, 1920. A cell for oxidizing Hg has means for supporting an anode and a layer of Hg in contact therewith, the support being a conducting element provided with a non-conducting lining, a cathode supported above the Hg, an electrolyte stirring device between the Hg and the cathode adapted to keep the surface of the Hg clear of oxide and means for admitting Hg to replace that oxidized. The lining on the anode support prevents electrical discharge between the cathode and the support.

Manufacture of Nitric Acid.

P. A. Guye, 200407, May 25, 1920. N_2O_4 is transformed into concentrated HNO_3 by intimately mixing water and O with an excess of liquod NO_2O_4 sufficient to keep the aqueous phase saturated with N_2O_4 until the end of the reaction (15 parts by weight of N_2O_4 to 1 part of water may be used) and causing the reaction to continue until the required concentration of acid is obtained.

Casting Steel.

Daniel T. Main, 199550, April 27, 1920.

Means for Making Aqueous Solutions of Gases.

Fred W. Thorold, E. G. R. Ardagh and J. T. Burt-Gerrans, 200225, May 25, 1920. Apparatus for making aqueous solutions of Cl consists of an electrolytic cell adapted to produce free Cl, means for introducing NaCl solution to the cell, means for supplying electric current to the cell, means for bringing water under pressure into intimate contact with the Cl gas evolved from the cell and means for utilizing the pressure of the water to transport the solution to desired points.

Electric Batteries.

L. R. Rhoades,197324, February 17, 1920. A dry cell lining of bibulous material has a coating of flour and water paste uniformly sprayed thereon.

Magnesium Chloride.

G. H. Bailey, W. A. Foster, 197326, February 17, 1920. Aphydrous $MgCl_2$ is made from porous briquettes containing MgO and C by treating the briquettes at a temperature of 750 to 800° with Cl practically free from O and allowing the molten chloride to flow off.

Magnet Steel.

K. Honda, 197567, February 24, 1920. A permanent magnet is made by quenching an alloy steel containing Co 5-60% and up to 10% Cr at a temperature above 800° and then magnetizing the body.

Magnet Steel.

K. Honda, 197568, February 24. 1920. A permanent magnet is made by quenching an alloy steel containing Co 5-60% Mo up to 10%. (Cr up to 10% may also be present at a temperature above 800° and then magnetizing the body.

Process for Dehydrating Peat.

Chas. Bouillon, 195549, December 30, 1919. Water is recovered from peat by bringing the pulverized peat into contact with a solution of $CaCl_2$.

Extraction of Zinc.

Robert H. Stewart, S. W. Blaylock, R. Vaughan and J. K. Batchelder, 197201, February 17, 1920. Zinc is extracted from its ores or concentrates in which the zinc has been rendered soluble by neutralizing the electrolyte with unleached calcine, maintaining a continuous circulation of the electrolyte through the neutralizing, separating, purifying, electrolyzing and leaching stages, continuously combining with the electrolyte at the leaching stage the solids and colloids separated from the electrolyte at the separating stage. The acid solvent is regenerated by the deposition of the zinc.

Method of Recovering Phosphoric Acid.

T. L. Willson, 197311, February 17, 1920. In the absorption of H_3PO_4 the circulating current of acid is cooled in circulating by means of a cooling bath.

Magnet Steel.

K. Honda, 197566, February 24, 1920. A magnetized body of an alloy steel containing Co, W and Cr is made by quenching the steel alloy at a temperature above eight hundred degrees and then magnetizing the body.

Distillation Tubes.

Fred. Wm. Sperr, Jr., 197542, February 24, 1920. A tube for experimental coal distillation comprises an outer tube for receiving the sample of coal to be distilled and a removable inner tube fitting closely within one end of the outer tube, the inner tube forming a receptacle for collecting at least part of the distillates.

Abrasive Material.

Nathan C. Harrison, 195760, January 6, 1920. An abrasive is made by mixing three parts of ground coke and two parts of ground cast iron borings with approximately 17 parts of diaspore and fusing the mixture in an electric furnace.

Treating Waste Gases from Soda Cellulose Factories.

A. E. Nielsen, 197280, February 17, 1920. The gases are subjected to the action of an absorption mass containing lime, preferably the "greenlime" obtained as a by-product in soda cellulose factories. The absorption mass is then used for the causticizing of soda solutions in closed vessels at boiling temperature

Method of Separating Water from Solutions.

E. Oman, 192187, August 19, 1919. Sulfite waste lyes are subjected to a stirring action to a temperature below the f.p., the snow and ice crystals formed are separated from the remaining lye and the low temperature of the

Alloys.

M. N. Salvati, 198504, March 23, 1920.

Treatment of Peat for Fuel.

K. E. Edgeworth, 198137, March 9, 1920.

Dimethyl Sulphates.

Walter N. Haworth and J. C. Irvine, 198404, March 23, 1920.

Ovens for Manufacturing Metal Alloys.

Michelo N. Salvati, 198505, March 23, 1920.

Treating Diaspore.

Otis Hutchins, 198559, March 23, 1920.

A BOOST FOR ZINC PAINTS.

Standard Paint Specifications under which the United States Government is recommended hereafter to purchase paints for the use of the Army, Navy and other departments have been determined upon by the Inter-Departmental Committee for the Standardization of Paint Specifications. The decision resulted from months of investigation and tests.

Two Features are significant: First, the importance of zinc oxide in increasing proportions is recognized by paint technologists on the Committe; second, the latitude afforded by the Specifications permits a large field of paint mauufacturers to compete for Government business.

The pigment proportions of the specifications follow:

	Minimum Percentage	Maximum Percentage
Zinc Oxide	30	55
Lead (Total, including either one or mixture of carbonate and sulphate	45	70
Inerts and colors	0	15

The purpose of these specifications is to provide for the purchase of prepared paints generally available in any section of the country without requiring paint manufacturers to make up special batches. It is believed these specifications will include the formulae of the majority of high grade paints on the market.

Of particular interest to paint manufacturers and users is the high proportion of zinc oxide introduced into the Government formula. This is regarded as one of the most sweeping official acknowledgements of this pigment's utility in paint yet recorded. Less than ten years ago, except in the Navy and the lighthouse service, no zinc oxide was included in paints used by the Government. Zinc oxide now composes 60 per cent. of the pigment of Battleship gray paint that covers battleships and other U.S. Naval craft.

American produced zinc oxide, however, has helped to paint the British Navy for 50 years; while France has been an exponent of zinc in paint for a long period, it was not until technical experts urged a mixture of zinc oxide in paint that Washington took official notice of it.

Now, the Capitol Dome is covered with paint containing zinc so that rust may be deterred; army cantonments are clothed with zinc paint, both inside and out, and during the war, zinc paint aided in camouflaging the big field guns in France as well as transports and battleships.

Recognition of zinc's efficiency has been a factor in the greatly increased popularity of ready-mixed paints. The durability of such paints make their use economical and they possess other advantageous qualities that commend them to users.

High-grade, ready-mixed paints include varying proportions of zinc oxide which range from 30 to 55 per cent. The liberal limits allowed by the Inter-Departmental Committee, however, insure the zinc portion being close to the higher figure inasmuch as zinc possesses great oil absorption properties and gives paint increased covering power.

Zinc paint also possesses color constancy; It has a tough, hard film.

It is interesting to know that all modern mill whites are now made exclusively of zinc oxide and lithopone; no lead is used. This is in direct contrast with the practice a few years ago. The advantage claimed is that paint holds its color longer, is cheaper and covers greater surface.

A HANDBOOK OF QUANTITATIVE ANALYTICAL CHEMISTRY.

Frequently the chemist needs a method for the determination of an element—possibly in a mixture involving difficult or unusual separations—either in research or in commercial work. It is necessary to make a thorough search of the literature or to devise a new method. After the latter course has been adopted, it may be discovered that there is a good method described in some journal not readily accessible to the worker. At the present there is no general reference book in which ALL the methods of procedure are systematically listed. In any one of the many excellent text books on quantitative analysis, only the representative methods considered most important by the writer are included, and these are usually discussed in detail.

The Chemical Catalog Company, Inc., 1 Madison Avenue, New York, have just completed the arrangements for the publication of a handbook or a compendium of quantitative analytical chemistry. The author is a member of the faculty of one of the universities devoting special attention to chemistry, and has had extensive experience in applied chemistry and in chemical engineering. It is planned to include every method given in chemical literature, both in English and in foreign languages. The work will be in two volumes, one Inorganic and the other Organic. The Inorganic volume will be published first. Every journal and book likely to contain methods of quantitative analysis will be carefully searched. The material will be thoroughly indexed, not only under the elements and compounds, but also under the commercial articles in which the element is to be determined. Copious references to the original literature will be given.

Naturally, the preparation of such a work is no light task and will require considerable time. However, every effort will be made to have the Inorganic volume of the work ready at the earliest possible date. The author will be assisted by the Editorial Staff of the Chemical Engineering Catalog and by an efficient clerical force. The price cannot be determined until the work has proceeded long enough for costs to be calculated with some precision, but every effort will be made to keep it low enough to make the book available to every chemist interested in quantitative analysis.

NATIONAL DRUG AND CHEMICAL COMPANY.

The report for the year to January 31 last states that, after paying all trade expenses, salaries to directors and officers, providing for bad debts, and paying dividends on preference shares, there is a balance of $124,168. The profit-and-loss account shows a trading profit for the year, after making provision for war taxation of $289,081. In April, 1919, the company purchased a 94 per cent. interest in the business of Palmers, Ltd., Montreal, which has proved a successful investment. Palmers, Ltd., is one of the leading sundry houses in Canada, and are sole representatives for several large French perfumery and toilet sundry firms. During the year the company placed in the hands of the trustees for the first preference shareholders, for the purchase of shares by way of redemption, the sum of $37,500, and, in addition, $25,060, representing the dividends on redeemed shares. The number of shares redeemed during 1919 amounted to 12,945, bringing the total shares reedeemed up to 86,769 at February 1, 1920.

RECENT BRITISH CHEMICAL DEVELOPMENTS.

In a review of the trade in chemicals in the United Kingdom during the past year, Sir S. W. Royse & Co., Ltd., of Manchester, state that the year's trading was satisfactory, and especially so during the later months, though handicapped by difficulties brought about by the war. A year ago there were still a good number of restrictions on commerce, but these, with some few exceptions, have gradually been removed. The volume of inquiry and the business done both for home and export have steadily increased, and the outlook for the new year is encouraging. Prices of many products have fallen considerably from the figures quoted at the beginning of the year, and the lower level of values has given more confidence to consumers, and materially contributed to the good business which has been passing. During the last few months the values of many products have again shown an upward tendency, and manufacturers are disinclined to sell far forward until they see their way more clearly in regard to supplies of raw material, fuel, etc.

Fine and Pharmaceutical Chemicals.

A large proportion of these materials used in the United Kingdom before the war was manufactured in Germany, who regarded herself as unassailable in the position which she had attained in the manufacture of synthetic drugs. As an example of this, the statement was made by the Germans in 1914 that British chemists would never be able to make salvarsan. Notwithstanding their confidence, however, salvarsan, or its allied products, is now being manufactured by the following United Kingdom firms: Burroughs, Wellcome & Co., Snow Hill Buildings, London, E.C.; Evans Sons, Lescher & Webb, Ltd., 56 Hanover Street, Liverpool; May & Baker, Ltd., Church Road, Battersea, London, S.W. The following fine chemicals are given, as examples only, of many which are now being made in the United Kingdom: Novocain, eucain, bromural, urotropin, guaiacol carbonate, organic silver salts, colloidal metals, benzoates, hippurates, phenacetin, paraldehyde, nucleic acid, chlorophyll, acetanilide, thymol, resorcin, phenolphthalein and bacteriological reagents.

Salicylic Acid and Salicylates.

This is another example of a monopoly in manufacture held by Germany before the war. These materials are now being made in the United Kingdom in sufficient quantities to satisfy the home demand and allow of a margin for export.

Salicylic acid is itself used largely in the manufacture of dyes, and also on account of its antiseptic properties as a food preservative. From the pharmaceutical standpoint, however, it is the intermediate material used for the manufacture of aspirin (acetyl salicylic acid), methyl salicylate (oil of wintergreen), and phenyl salicylate (salol).

Some of the United Kingdom firms, in addition to those given above, who are now manufacturing fine and pharmaceutical chemicals are: Stafford Allen & Sons, Ltd., 7 Cowper Street, Finsbury, London, E.C.; Boot's Pure Drug Co., Ltd., Station Street, Nottingham; British Drug Houses, Ltd., 22-30, Graham Street, City Road, London, N.; W. J. Bush & Co., Ltd., Ash Grove, Hackney, London, E.; T. Kerfoot & Co., Bardsley Vale, Bardsley, Lancs.; London Chemical Works, Ltd., Scott's Road, Southall, Middlesex; Thomas Morson & Son, Ltd., Gray's Inn Road, London, W.C.: Oppenheimer, Sons & Co., Ltd., 179 Queen Victoria Street, London, E.C.; Southall Bros. & Barclay, Ltd., 19-21 Lower Priory, Birmingham.

Important Chemical Combine.

In 1916 a community of interests was established between the well-known chemical manufacturing concerns of Brunner, Mond & Co. and the Castner-Kellner Alkali Co. by means of mutual share holdings. Shares to the number of 250,000 were created by the latter undertaking and issued to Brunner's in exchange for 200,000 shares of that concern. The agreement then made foreshadowed a complete fusion between the two businesses, and this fusion is now about to take place. The issued capital of the Castner-Kellner Co. is £1,000,000, while the present authorized capital of Brunner, Mond is £15,000,000.

New Candle Factory.

It is reported that Lever Bros., Ltd., have acquired some 140 acres on the banks of the Avon, at Newton St. Loe, the western suburb of Bath, for the purpose of erecting a large candle-making factory. The total expenditure contemplated is close on £1,000,000.

Soft Soap, Boot Polishes and Disinfectants.

W. A. Bonnell, Ltd., 17 Railway Approach, London Bridge, London,, S.E., are in a position to supply from fifty to sixty tons of soft soap weekly to any specification, as well as quantities of boot blacking and disinfectants, and would be glad to hear from any inquirers wanting these goods.

Scientific and Industrial Research.

The establishment of associations for scientific and industrial research in connection with the scheme administered by H.M. Department of Scientific and Industrial Research, is going forward satisfactorily. Fifteen important British industries now have research associations which have been approved by the Department. They are as follows: Footwear, etc.; Cotton; Wool and Worsted; Linen; Iron; Non-ferrous Metals; Motor Cars, etc.; Rubber and Tires; Glass; Portland Cement; Photography; Scientific Instruments; Refractory Materials; Sugar; and Cocoa, Chocolate, Sugar Confectionery and Jam.

Schemes for the establishment of Research Associations for the Music Industries and the Scottish Shale Oil Industry have reached an advanced stage of development, as have also schemes for the following industries: Aircraft, Electrical and Allied Goods, Leather, Silk, Laundering, Master Bakers and Confectioners.

In addition to these, schemes are being proposed for the industries engaged upon Marine Engineering and Shipbuilding, Agricultural Machinery, Cycles and Motorcycles, and China Clay.

A vast amount of the time and thought of many of the country's ablest scientific men is being devoted to improving the technique of production in all these industries. And no inconsiderable amount of money is being spent. The Department of Scientific and Industrial Research, in addition to rendering assistance in many other ways, makes grants to approved associations out of a million sterling fund which the Government has allocated for the purpose. But these grants are supplementary, and the main resources of the associations are obtained from associate firms.

The Microscope and Industrial Developments.

An exhibition was held during January in the rooms of the Royal Society, Burlington House, in connection with a symposium and general discussion on the microscope, its design, construction and application. The symposium was organized by the Faraday Society, the Royal Micro-

scopical Society, the Optical Society and the Photo-Micrographical Society in co-operation with the Optical Committee of the British Science Guild, and had as its general object the improvement of research work in microscopy and its application to industry.

The importance of the microscope in relation to almost every branch of industrial activity was demonstrated by examples of its use in the preparation of foodstuffs and chemicals, as a final court of appeal in the analysis of textiles and in its close connection with the development of metallurgy. Indeed, the exhibition emphasized the fact that the microscope, from being merely the instrument of the scientist, has become an essential factor in industrial development.

In the sphere of photo-micrography the exhibition contained examples of several new improvements of photo-micrographic instruments. There were also on view numerous slides demonstrating how the microscope is used as a test of constitution, both chemical and physical. The mineral sections were of great interest, and now that the structure of coal is part of the analysis, a series of slides showing sections of coal clearly demonstrated the value of micro-photography in addition to the ordinary chemical and physical tests.

At the symposium, at which Sir Robert Hadfield presided, papers were read dealing with the manufacture and industrial application of the microscope.

News Items

Quebec.

Montreal.—McArthur, Irwin, Ltd., have recently completed the contruction of a large warehouse, owing to the increasing heavy demand for their products, chemicals, paints, varnishes, colors and dyestuffs.

Bovril, Ltd., the British food specialists, will erect a plant here, and have secured a 25,000 square foot plot on which to erect a five-storey building.

St. Hyacinthe.—The Canadian Manhasset Cotton Co. are erecting a plant for the manufacturing of tire fabric at an investment of $1,450,000.

Upper Bedford—The Torrington Co., manufacturers of knitting machine needles, will extend their plant and will manufacture screws, rivets, electric vacuum cleaners and other of their United States plant products.

The Canada Paint Co. have installed new machinery, increasing their capacity 25 per cent.

Ontario.

St. David's.—A new canning factory is under construction here, to be known as the Silver Lake Canning Co. New storerooms and boiler rooms are being erected, and already over 35 acres of tomatoes have been contracted for. St. Catharines men are behind the new company.

Sarnia.—The newly formed Lake Huron Steel Corporation, composed of New York, Detroit and Pittsburg capitalists, will, it is reported, erect the largest steel alloy plant in America here at a reported outlay of $20,000,000.

Nova Scotia.

Glace Bay.—The Dominion Coal Company will shortly open a new 600-foot shaft at Quarry Point, about a mile and a quarter from No. 4 Caledonia colliery, which will result in the closing down of the latter and the doubling of its output. The new shaft will have, it is expected, a daily average of from 1,500 to 2,200 tons.

WORK ON TRENTON PLANT PROGRESSING.

About 100 men are at present engaged reconstructing the plant formerly owned by the British Chemical Co. at Trenton, Ontario, recently acquired by Chemical Products, Ltd., of Toronto. Construction work on new additions will commence as soon as the present buildings have been altered and reconstructed to suit the needs of the new processes. It is the company's intention to start manufacturing pharmaceutical products such as aspirin, phenacitine, salicylic acid, potassium permanganate, etc., about August 1st next. These pharmaceuticals will be manufactured by using the equipment (eleven carloads in all) sent to Trenton from the plant at Toronto, formerly operated by Chemical Products of Canada, Ltd., now superceded by the new organization, Chemical Products, Ltd. The Toronto plant will not be used further. By pushing the construction work the company hope to be able to have their heavy chemicals on the market by next fall.

MEETING OF MARITIME CHEMISTS, JULY 27th.

The Maritime Chemist's Association will hold their annual meeting in St. John, N.B., on July 27th. Papers will be presented by Dr. Abramson, of the St. John General Hospital, and Mr. C. E. Wallin, Superintendent of the Coke-Oven Department of the Dominion Steel Co., Sydney, N.S. Matters of considerable general importance to chemists in the Eastern Provinces will come up for discussion. The question of the formation of a Section of the Society of Chemical Industry will be dealt with. A. F. Blake, of the Atlantic Sugar Refineries, St. John, and H. B. Vickery, Armdale P.O., Halifax, would be glad to hear from chemists who might be able to attend this meeting.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

Few changes of note may be mentioned in prices. Those who have stocks available are well able to dispose of them, and many orders remain unfilled or delayed. Canadian producers who have started in a small way on such products as zinc oxide and hexa, for example, are finding a ready home market for more than they are able to turn out. It is anticipated that larger quantities of Canadian-made aspirin will shortly be on the market. It is stated that the demand for a few commodities such as caustic soda is slightly less. In some instances, there has been a slight reduction in price, but this has not more than covered increasing exchange rates. English interest in Canadian business is increasing slightly. Arrangements with agencies are being made gradually against the time when greater production in England will allow more attention being given to Canadian business. The tendency to manufacture on the ground wherever possible is a factor and should stimulate production in Canada of such chemicals as are used in any quantities in industrial ways. It is known that different firms are investigating market conditions here with a view to manufacturing in a small way for Canadian consumption.

The producers of commercial gases are increasing their outputs, and one firm at least has recently expanded their

hydrogen business. The reports from England that the production of helium will be undertaken in Canada on a commercial scale are of some interest.

Metals.

General trends and tendencies in business are always reflected in metal markets. The latest silver drop is now an old story. Its effects and causes are part of the cycle. Transportation difficulties, the general business outlook and a host of factors have allowed steel mills to catch up on orders remarkably, but there is no great reduction of accumulated mill stocks. Persistent speculative buying on all sides produced the usual after effect in the tin market. Copper remains generally dull, with but little more than the usual interest in future business, following the recent drop in London copper.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Alum, Ammonia, lump and ground	100 Lbs.	.. — 7.00
Ammonium Bromide	Lb.	.. — 1.15
Aluminium Sulphate, high grade, bags	100 Lbs.	5.75— 6.00
Ammonia, Aqua 26	Lb.	.10½— .12
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.18— .25
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—50.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	3.25— 3.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	.. —45.00
Camphor Monobromate	Lb.	.. — 5.75
Carbon Bisulphide, in drums	100 Lb.	.14— .16
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, bbl.	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. —.02½
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.11¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.. — .17
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .25
Hydrofluoric Acid, 30%	Lb.	.. — .11
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.05½—.06½
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—110.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	85.00—90.00
Mag. Sulphate, Tanner's Canadian Salts, car lots	Ton	75.00—80.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — 1.20
Potassium, Bromide, granular	Lb.	.. — 1.15
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — ..
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — 1.35
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 4.00
Sodium, Bichromate, bbls.	Lb.	.45— .55
Sodium Bisulphite, powder	Lb.	.. —.08½
Sodium Bisulphite, 35	Lb.	.. —.03¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.00— 2.25
	Per Cwt. in Car Lots	.. — 1.70
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.. —.08¼
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —45.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

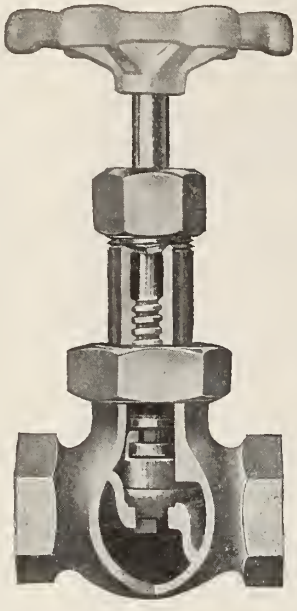
Acetanilid, C. P.	Lb.	.. — .80
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.06¼— .07
Acetic acid, refined	Lb.	.. — .21
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.35— 1.40
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	..35— .80
Formaldehyde	Lb.	.75— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .28
Hexamethylenetetramine		3.50— 4.50
Oxalic Acid	Lb.	.. — .65
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	.. — 3.00
Quinine	Oz.	.90— 1.00
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .45
Tartaric Acid, crystals or powdered	Lb.	1.10— 1.25

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.32— .40
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.11½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.35— .40
Platinum, pure	Oz.	..—105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. — .10
Spelter, in car lots	Lb.	.. —.09¾
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00



NON-CORROSIVE DISC VALVE

REGRINDABLE REVERSIBLE RENEWABLE

Brass Union Bonnet Regrinding Stationary Spindle Non-Corrosive Disc Valve.

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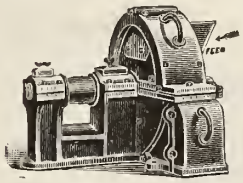

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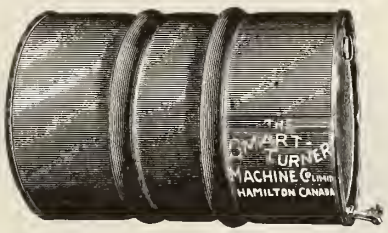

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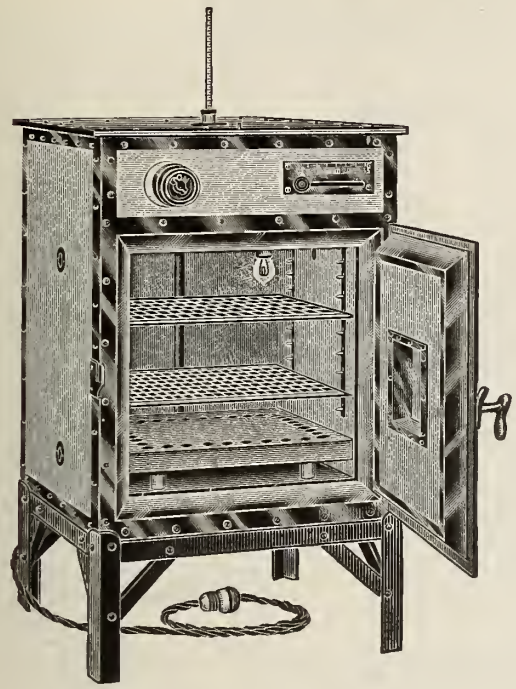

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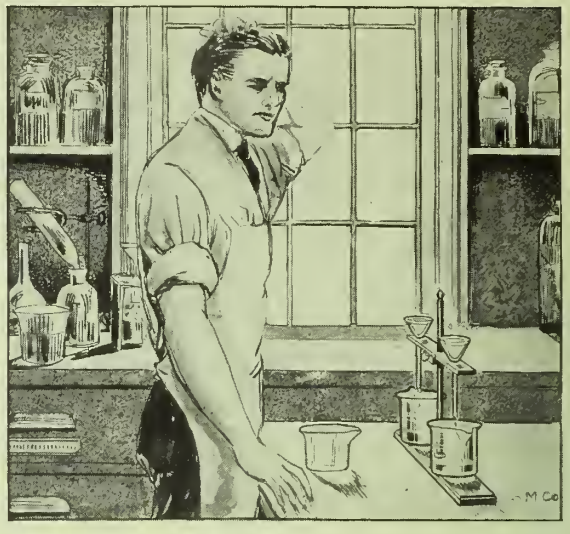

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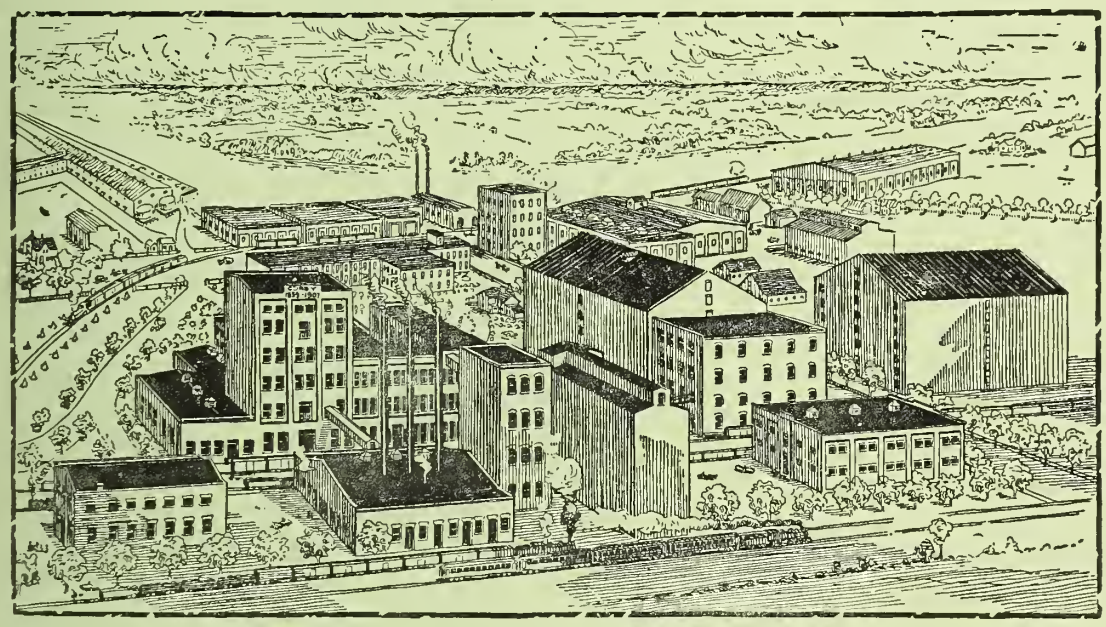

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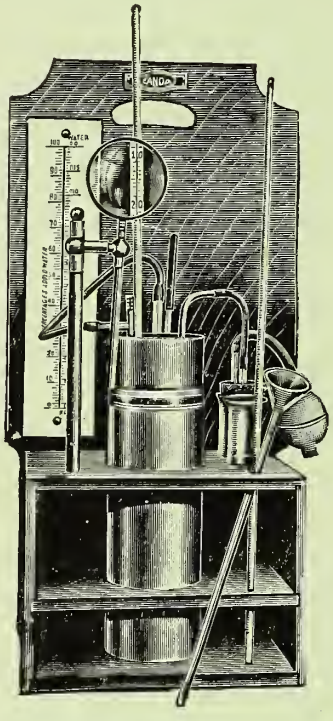

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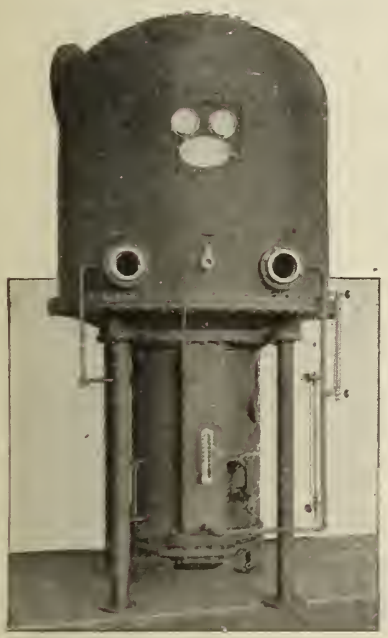

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PROVINCE OF ONTARIO
DEPARTMENT OF LANDS FORESTS & MINES
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Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Summary of Mineral Statistics, 1919.

Product.		Quantity.		Value.	
		1918.	1919.	1918.	1919.
Metallic:					
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, holow building		.....	.....	195,588	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,720
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc.		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	80,308,972	57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

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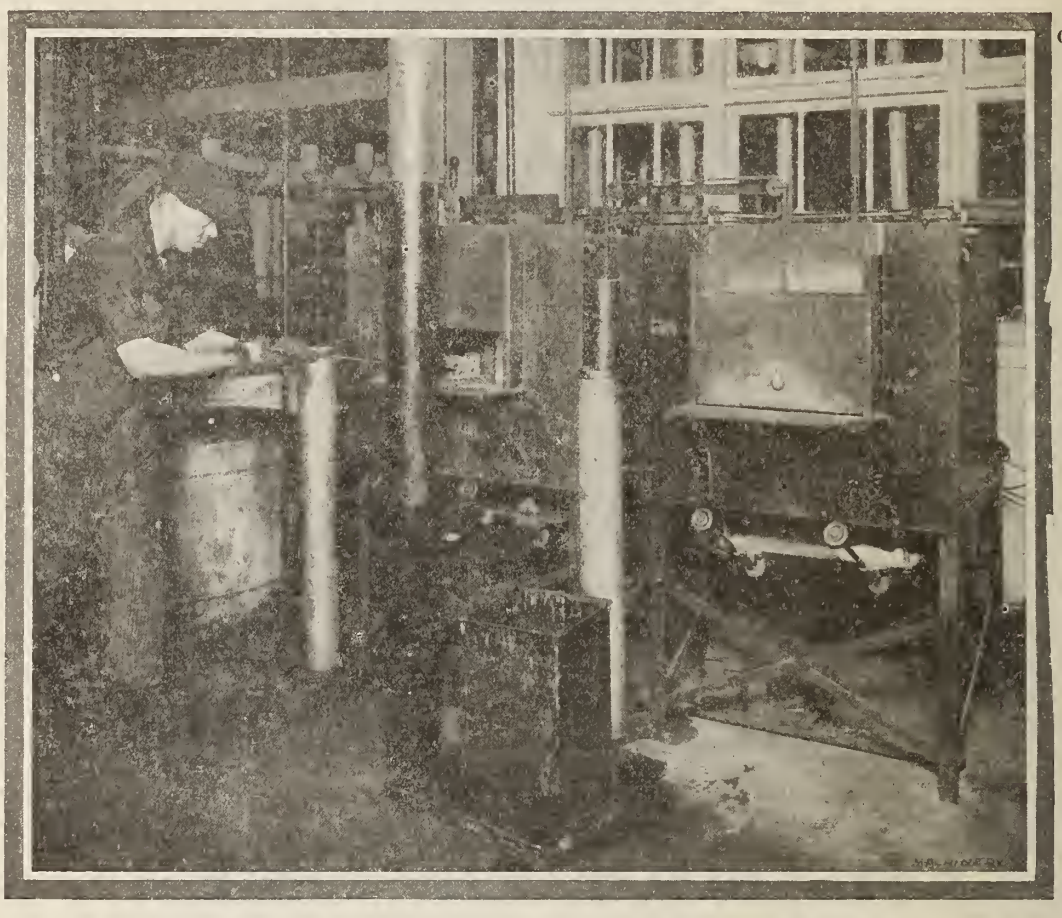

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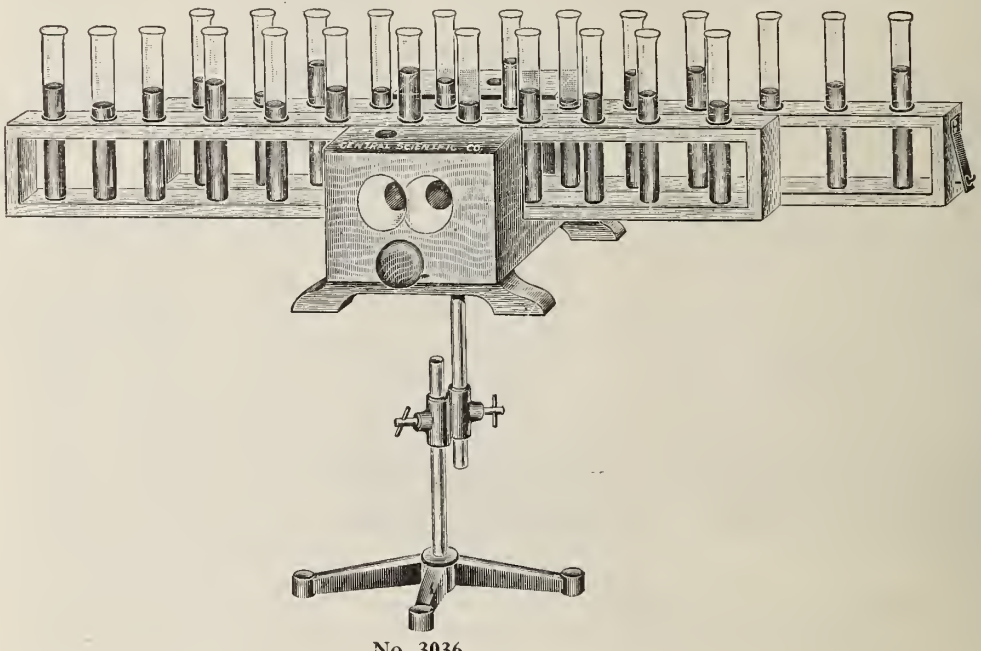

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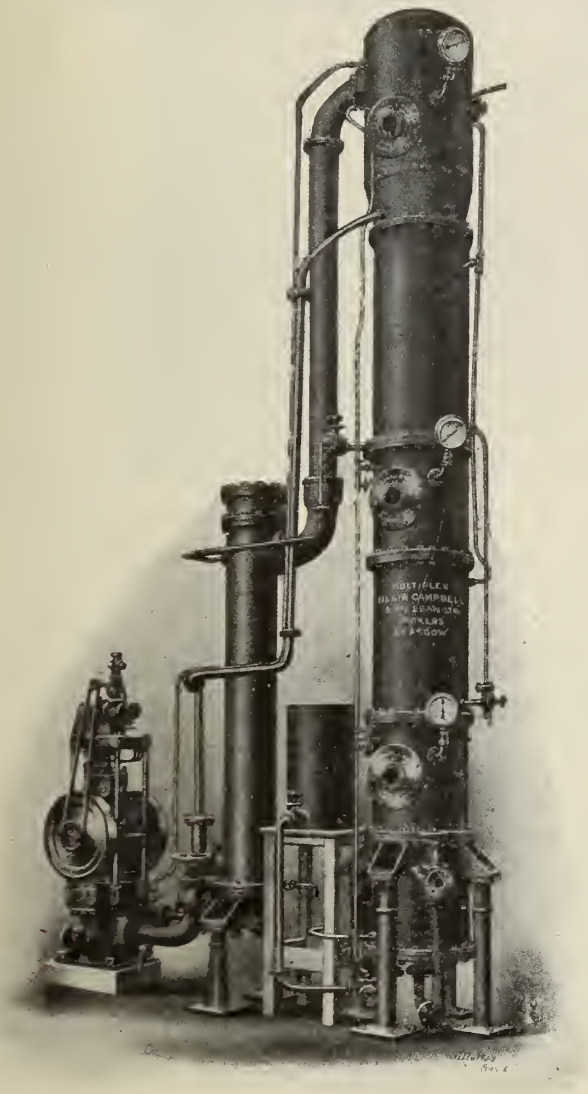

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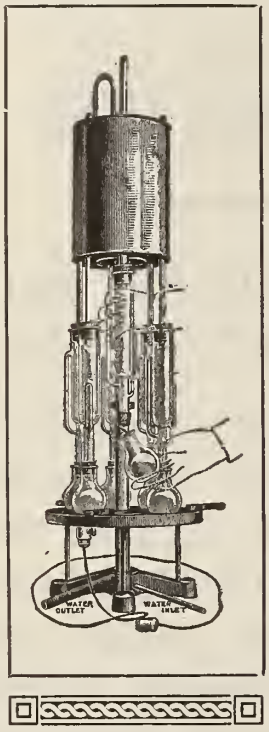

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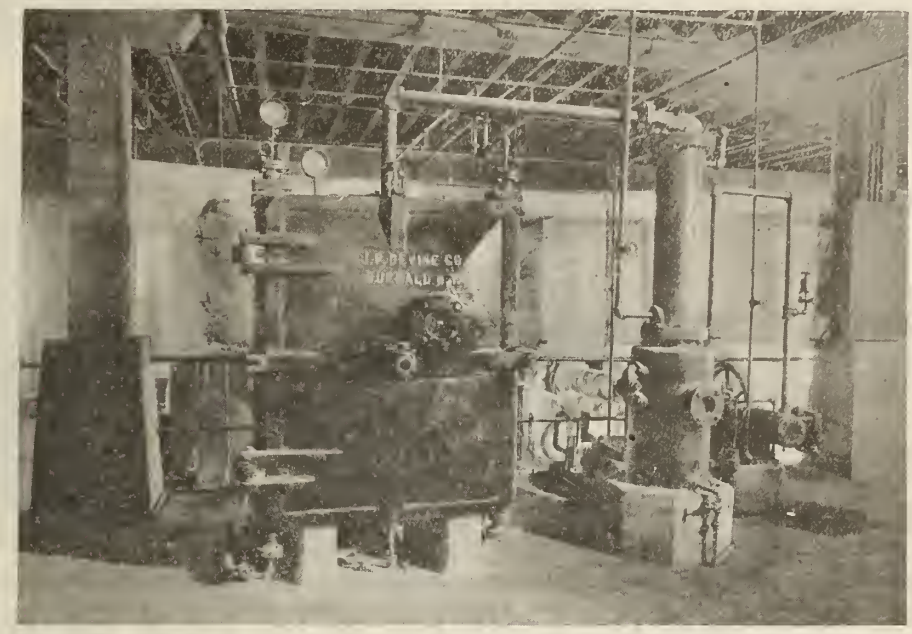

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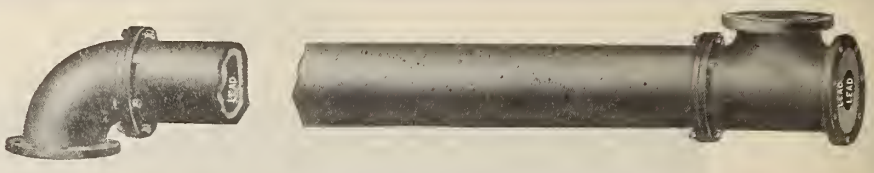

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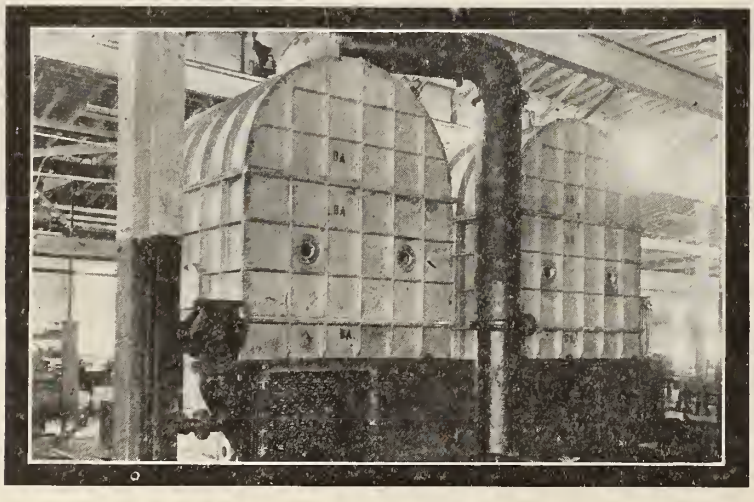

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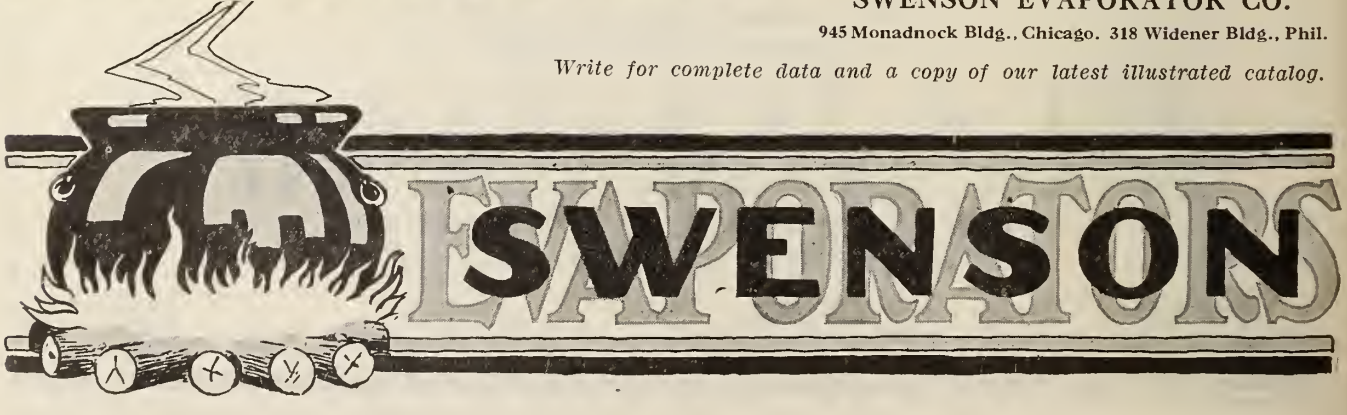

CANADIAN CHEMICAL JOURNAL

A Canadian Journal devoted to Metallurgy Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 | TORONTO, AUGUST, 1920 | No. 8

P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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EDITORIALS

AN EDITORIAL INTRODUCTION.

WITH this issue our readers will note that a distinct addition has been made to the staff of the Chemical Journal. Mr. T. Linsey Crossley has accepted the helm and as editor will assist in the direction of the paper.

Mr. Crossley needs no particular introduction to Canadian Chemists. They have known him and he has known them for some time. There has been no keener leader in all movements designed to consolidate their organizations and develop the scope of their influence and work. As a Consulting Chemist and Engineer he has taken an active interest in all matters relating to technical education and is closely associated with new movements along these lines in the pulp and paper industry. He represented the Society of Chemical Industry in the last Industrial Congress at Ottawa, and has been active on several occasions in matters relating to present-day labor problems, voicing the sane thought of professional men.

Perhaps few in Canada have done more to create common ground for the chemist and professional engineer. By linking up more closely these groups of professional men, a force may be created which should stimulate and develop all concerned. We welcome Mr. Crossley to the Chemical Journal, knowing full well that the chemists of the Dominion will benefit thereby and the industries represented by the paper will have a stout champion.

TARIFF SUGGESTIONS.

THAT old Moor who opened the first custom house at the Pillars of Hercules, had little idea what a precedent he was setting.

His scheme was a "revenue only" proposition. Protection, "dumping," "excise," "countervailing," "preferential"—what a progeny of unaccommodating trapezoidal words now cover up the various means whereby Tom, Dick and Mary support a garden of delicate exotics, or keep Jack and Jill from giving away the indigenous potato and pulp wood.

There is to be a peripatetic Tariff Commission this fall, wide open as to inquiry, and, we trust, also as to attitude.

It would come as a shock, pleasant, but distinct, if we were to be advised that the personnel of the commission would include a chemist and an engineer in addition to the customary "lawyer, merchant, chief, butcher boy, plough boy—" politician.

Much is said of a "scientific" tariff, especially to protect industry.

In view of the vital interests of science in properly designed tariff legislation, have any of our professional bodies appointed committees to make their wants vocal?

HOW IT WORKS.

APART from a technical claim that platinum makes a stronger setting for precious stones, due to some physical advantage over gold, there is no adequate reason in use or beauty to justify the extensive use of platinum in jewelry.

Even in war time it was not found possible to make people, who had the money to procure it, refrain from the use of platinum jewelry, and this in spite of the fact that its withdrawal from industry was a catastrophe in posse every day. Here's how our tariff handles platinum:

> Item 363—Wire and bars, strips, sheets, or plates, free.
>
> Item 488—Platinum and black oxide of copper for use in manufacture of chlorates and colors, British preference 5%, Intermediate 7½%, General 7½%.
>
> Item 489—Platinum Crucibles. Same as item 488.
>
> Item 490—Platinum, retorts, pans, condensers, tubing and pipe, and preparations of platinum when imported by manufacturers of sulphuric acid for use exclusively in the manufacture or concentration of sulphuric acid in their own factories, British Preference 5%, Intermediate 7½%, General 7½%.

The effect is that material for use in industry and science pays duty, while the material available for working up into jewelry is free. How that can be made to inure to the protection of Canadian industry is not apparent.

HAVE WE A REPRESENTATIVE GOVERNMENT?

IMAGINE some of our chemical friends or engineering colleagues entrusted with the framing of a bill to present to the Imperial Parliament having in view the establishment of a court of last resort in the Dominions to replace the Privy Council, or an act to revise the proceedings in chancery.

Our representative (?) system of government has resulted in a situation wherein lawyers, country doctors and farmers are called upon to legislate upon the details of forest protection, water pollution, rail-

road operation, food conservation, the development of mines and technical education.

Is it not time that our agrario-medico-legal friends had some technical colleagues at Ottawa and the Provincial Capitals? No group of men is better prepared to discuss these subjects in a disinterested way, or better equipped for the discussion, than chemists or engineers.

The question may well be asked whether a representation that is geographical and based on population only, is really representative.

Would not a chemist from Winnipeg or Halifax be more representative of the chemists of any part of Canada than a farmer, lawyer or labor leader from their home town?

Let us have chemists in Parliament and let our engineering friends have engineers in Parliament. "Even though they be voices in the wilderness," let's have a voice!

CHEMISTRY AS A BUSINESS.

THE creation of a business conception of chemistry as distinct from a professional viewpoint is a difficult and slow process. If chemistry were not so all-embracing it might receive more general consideration. It is like the air—people do not sense its existence. A bridge may be appreciated by all in a way quite impossible to apply to something taking place in solution in pipes and containers. It is this idea of visibility that has left the test tube stage of chemistry so well impressed on the public mind.

If the principles of chemistry as applied to industry were not so vastly important, so general, and so essential to the conservation of resources and their proper development, the chemist would have less right to seek a better public knowledge of his work and his technique. The public mind may be trained to enjoy a keener conception of matter and forms of energy through education. If personal liberty and happiness are to remain together in an advancing world, nothing short of a vastly increased social uplift of the average mind can accomplish it. One of the factors would be a better conception of the scientific inter-relationships which exist between phases of industry, and as chemistry in general supports such a part of this structure, there is every reason why the public should be shown this foundation of modern life on suitable occasions.

The one time in Canada when the public is gathered in largest numbers annually is the Canadian National Exhibition. A small representative group of companies are this year, for the first time, attempting to show chemistry as a business on this public occasion. Located together, these twelve apostles of something new, are placing exhibits in the Industrial Chemical Section of the Exhibition, located in one of the Industrial Buildings, and upon its success will depend to some extent the establishment of a new style on the part of others—namely, the style of putting your chemical foot forward.

Chemistry is basic to all industry. If the froth of the subject appeals so strongly to the public mind, and is seized upon so rapidly by the press on occasion, is there not good hope that something really beneficial may be accomplished by this new movement?

For those who are pioneering in this line we believe there will be a reward not alone indirectly, but immediate, and we wish the new Industrial Chemical Section of the Canadian National Exhibition the support of all chemists and the direct use of every influence they may possess to make it a success. With each of you boosting, the total publicity will count not a little. In this number some space is devoted to an industrial account of the progress and development of the companies exhibiting, and members of the Society of Chemical Industry should not forget that through the kindness of one of the exhibiting companies space has been reserved in the Industrial Chemical Section, where a member of the Society will be present each day to welcome those interested in Chemistry to the Chemistry Section.

ROPES OR STRANDS?

IN the July Journal of Industrial and Engineering Chemistry there is a catalytic editorial suggestion which has all kinds of attractiveness. Just how a joint meeting, convention or jubilee spree, of British and American Chemists can be arranged for September, 1921, may present difficulties, but does not prevent an expansive sensation of gladness in contemplation.

The executive of the National Exposition of Chemical Industries is taking up the suggestion with the executive of the S.C.I.

We have pleasant hopes that the itinerary of our Old Country visitors in the summer of 1921 can be arranged to wind up at New York in a burst of international good fellowship of the hearty sincerity that few other than chemists can enjoy.

E.I.C. ANNUAL, 1921.

A NEW departure is to be taken in the proceedings of the annual business and professional meeting of the Engineering Institute of Canada, February 1st, 2nd and 3rd, 1921.

There are to be sectional concurrent meetings. One of the sectional meetings will be that of the Chemical Engineers.

We welcome this stirring in the valley of dry bones.

The meeting is to be held in Toronto and it will be the first time the Institute has held its annual

outside of Montreal. A strong local committee is enthusiastically at work and we are assured the 1921 meeting of the E.I.C. will mark substantial scientific and professional progress in Canada.

Dr. Herty says he had a good time here in May. His sound, practical address and pleasant personal presence leave our account with some debit balance yet.

The Chemical Industry of Canada is yet in long clothes and is trying to retain its morsel of candy which may fall into the hands of that voracious Teuton gamin, or the equally voracious bigger brothers, who, while acknowledging family ties, are also fond of candy so available.

COMPLETE NATIONAL ORGANIZATION NECESSARY TO INTERNATIONAL RELATIONSHIPS.

By A. Burton, Honorary Secretary, S.C.I.

Following up Dr. Herty's inspiring address at our last Convention of Canadian Chemists and his expressions in the Journal of Industrial and Engineering Chemistry, it is easy to see that the time is opportune for the development of a greater sense of comradeship amongst our various chemical societies, and that the present day is essentially international in its character, pervading finance, commerce, industry, science, art, literature, war and sport.

This manifestation is good if its application is turned into channels for the benefit of mankind.

As a sound foundation upon which to develop internationally, we must first have a healthy national spirit, and if we believe in essential unity, we must admit on the other hand the value of individual nationality, and if we admit individuality we must also admit the individuality of groups and men. This recognition leads to the acceptance of national effort and eventually international comradeship.

In setting out to put this into practice let us remember that one man is as different from his neighbor as one nation is different from another in point of view of its aspiration, needs, and perspective. It has been said, "men may change their clothes, their politics, their wives, their religions, their theories, but they cannot change their grandfathers"; therefore, as we are a reflection of the past we must try to treat with others as we would have them treat with us. This brings us naturally to the question of how are we to develop a strong national spirit amongst our chemical groups to lead to the formation of national effort which ultimately will be able to rise to the higher plane of international comradeship. This is a structure we must set ourselves to raise in a spirit of tolerance, honor and respect for our distinctive nationalities.

We have begun well in Canada and our three Canadian Conventions have stimulated this national effort, which if soundly established will set us well on the road to the ultimate goal. Let us then set our internal chemical organizations in perfect gear and "join hands all round, for yum yum, a good time is coming!"

MATTAGAMI RIVER SIDERITE AND OTHER NORTHERN ONTARIO DEPOSITS OF VALUE.

The report of a trip to James Bay, starting from National Transcontinental Railway, using Abitibi and Mattagami Rivers, forms part of the 29th annual report of Ontario Bureau of Mines.

J. G. Cross, M. Y. Williams and Joseph Keele examined known deposits of value. On the Mattagami River, about 79 miles north of Mattagami Station, an ore of iron essentially siderite, was found, with a maximum width of 600 feet. The ore was found in two zones; a second zone larger than the above was noted, but quality of ore poor. Analysis on best samples showed iron 43.52% and 47.10%. It is assumed that iron was carried in solution as ferrous sulphate, and reacted with the limestone to form $Fe\ Co_3$ and $Ca\ SO_4$. The age is considered to be the same as refractory clays of the district, namely, Cretaceous. Some work has been done on these deposits, but no real survey by drilling and sampling ton lots is available. Other deposits of a more or less similar nature are known in Northern Ontario, and while the roasting problems would be difficult, nearby areas of peat might eventually be used.

On the Moose River, economic deposits of gypsum await development. The report of Mr. Williams on the oil shales is rather encouraging. Black bituminous shales outcrop on the Mattagami and Abitibi Rivers, with evidences that they are of Portage age. Exposed sections are 30 feet high, and their general nature would indicate greater depths. Weathered samples showed as high as 26% volatile matter, and one gave a yield of 5.5% crude oil.

The report by Mr. Keele on the clays of these districts is most valuable. Their formation and characteristics are discussed. The chemical industries will be specially interested in the report on Fire Clays and the work done by C. M. McCarthy, of Elk Lake. Beside these valuable clays, deposits of exceptionally pure silica, suitable for glass sand, were observed. About 15% of white clay occurs with the sand.

GEOLOGICAL SURVEY OF MARMORA DISTRICT.

Field parties belonging to the Geological Survey Branch of the Department of Mines, Ottawa, are carrying on surveys in the Marmora, Ontario, district this season. The work includes the preparation of a geological map of a strip of territory extending for fifteen miles in width from Belmont township on the west, to Hungerford and Elgeria on the east, and also the examination of all mines and prospects in this area. The survey necessary for the preparation of the map is being carried on under the direction of Messrs. E. E. Freeland and R. A. McDonald.

CONFERENCE HELD BY NIAGARA DISTRICT INDUSTRIAL ASSOCIATION.

From August 2nd to 4th, the various municipalities of the Niagara Peninsula held their first joint industrial conference. Visits were made to the industrial plants in the district, and a series of enthusiastic meetings were held at principal points. No better opportunity for a close view of the district could be desired by an industrial visitor.

The two great projects, the building of the Chippewa-Queenston Power Canal and the new Welland Ship Canal, are revolutionary in their significance. Some considerable description of present industrial developments in this part of Ontario and the future outlook will be presented in the next issue.

Notes on Some Decolorizing Blacks

Decolorizing of char coeval with Beet Sugar Industry. Originally Powder, later Granular. Char absorbs many substances. Color always the property affected. Eponite, Norit, new blacks. Experiments to find new black. Successful product Karbos.

By C. F. BARDORF*

The employment on an industrial scale of substances containing a large percentage of amorphous carbon as a decolorizing agent, is an art that has been developed during the 19th century. Lowitz is credited with having first recognized, in 1792, the decolorizing power of carbonized plant tissues, and a few years later wood charcoal was suggested as a decolorant for sugar solutions. But the residual carbonaceous products obtained from the destructive distillation of animal tissues presently superceded those of plant origin, as the power of the former soon gave evidence of their much greater efficiency as decolorants, and the eventual introduction of animal bone-black in a granular form, and therefore more readily revivifiable, secured to this material the most important place among decolorant blacks of commerce.

In passing, it may be remarked that the convenient word "Char" will be used in the place of Bone-black, Animal-black, and the like.

It is a curious coincident that the early studies on the decolorizing and purifying properties of char, and black in general, were almost coeval with the development of the beet-sugar industry of western Europe during the first half of the last century, and the first investigators on char utilization were nearly all more or less intimately connected with the then rapidly progressing industry of beet-sugar manufacture and refining.

Initially the different decolorizing blacks were employed in a powdered form, and in as fine a state of comminution as practice permitted. Even char was then ground to a fine powder and added to sugar solutions, the liquid heated, agitated and the char strained off and discarded. It was not until 1825 that the possibility of regenerating the decolorizing power of a several times used chardust was shown to be practicable, but, of course, the handling of immobile, yet dusty substance presented many difficulties. In 1828, however, Dumont suggested the granular form of char, and thus a true filtration was made possible and the handling and revivification greatly facilitated. Again, another form of bone carbon was tried. The charred bones were ground, digested in HCl; the soluble salts washed out with water and the residual carbonaceous matter was known as "Purified Animal Black." This so prepared black cost something like two shillings per pound in England at the time.

Explanation for Decolorizing Not Known.

Generally speaking, nearly all blacks of a non-graphitic nature possess some decolorizing power, and the phenomenon was so marked in the best of them that many investigations were made with the object of discovering the cause, or causes of this reaction. Schools stood divided between physical and chemical explanation of the facts in the case. It may be fair to say, without discussing the pros and cons of either contention here, that we have still to find a theory based upon adequate experimental data to account for all the reactions exhibited. There is hope, however, that the recent changes in the concepts of the nature of solutions of salts and the recognition of the colloidal condition of many coloring matters when dissolved may presently yield a rational basis for a chemistry of decolorizing blacks.

But char does not only absorb color from complex solutions; it will also retain—and frequently with great avidity—certain mineral and organic salts and a large number of organic compounds of diverse chemical composition. Alkaloids, for instance, are tenaceously held by char and many other amorphous blacks, so much so, indeed, that a finely divided black, such as the purified animal black just mentioned, has been used as an alkaloid antedote; and it is considered particularly effective if administered immediately after the alkaloid had been swallowed. The occlusion of gases by blacks is another phenomenon of importance, as under certain conditions of adsorbed oxygen, char and other blacks will darken colored solutions instead of bleaching them.

These, then, are the generally well known phenomena to be observed when liquids are filtered through or digested with char or powdered amorphous blacks. Be the reaction upon an impure sugar solution, on a glucose solution, on liquid paraffin, molten or liquid fat, or on crude glycerol, the black absorbs primarily color and incidentally other substances that may be associated with the principle constituent of the liquid.

Eponite, a New Decolorizing Black.

Limiting our discussion, from now on, almost entirely to cane-sugar solutions, it is a matter of regret that during the last fifty years comparatively little progress has been reported on what may be called the Chemistry of Amorphous Blacks, more particularly in relation to their decolorizing functions. With few exceptions, isolated, ununified and incomplete experiments only are on record, and as such have but a limited theoretical interest and are generally void of comparative practical value. It appears desirable that considerable pure research work should be carried out as a preliminary to applying the knowledge so acquired to problems in the industrial field. Advance in practical char chemistry, to be of general value, must of necessity be conducted along well established and unified lines, so that investigations made by one chemist may be repeated by another. Some agreements must be reached as to what lines of experiments are most promising; what shall be the form and size of apparatus and the units of filtration and digestion, together with quite a number of other particulars.

This somewhat lengthy introduction has been induced by the fact that the chemistry of decolorizing blacks has been describing a decidedly upward curve during the last ten or fifteen years; and it is under this consideration that the author ventures to outline a series of experiments begun in 1911, which, however, were unwillingly laid by in 1913.

In 1916 the author had the honor of reading a paper on Tintometry before this section, and indeed the facts

*Paper read by Mr. Bardorf at meeting of Montreal Branch, Society of Chemical Industry, January 23, 1920, and presented at meeting of Canadian Institute of Chemistry, Toronto, May 27, 1920.

therein presented, were the results of an endeavor to establish a fairly reliable and comparative color analysis as a preliminary step towards a systematic investigation of some char problems.* The completion of this tintometry work came upon the eve of the first appearance of a most interesting decolorizing black, called Eponite, now known as Norit, the application and operation of which has been under patent protection since 1915, I believe.

In January, 1911, the Chemisges Centralblatt drew attention to a new decolorizing black, Eponite, which was described by Dr. Strohmer, of Vienna, as a fine, mealy powder —a soot it should have been called—of a dull, deep black color, having the following composition:

Water	9.41
Sand and sol. Si.	2.46
Carbon	81.99
Hydrogen	1.72
Nitrogen	0.10
Oxygen	2.64
Ash	1.68
Composition of the Ash:	
Potassium	20.58
Lime	39.29
Phosphoric Acid	2.69

Strohmer further stated that microscopical examination revealed no striking characteristics, but that the black might be viewed as a completely carbonized vegetable substance.

After some correspondence with the Carbon Werke, in Ratibor, Selicia, where Eponite was being made, a sample was secured and finally a lot of three tons was bought at a cost of $8.27 per 100 pounds. Thus Montreal was the first city on this side of the Atlantic to receive a shipment of this new black. (February, 1911.)

Regenerated Eponite More Efficient Than Crude Material.

The first preliminary experiments were made in the laboratory of the St. Lawrence Sugar Refineries, Limited, along the lines indicated by Dr. Strohmer, and as regards color reduction and clarification these experiments were entirely satisfactory upon a small scale, but when the investigations were carried on with a view of using Eponite in practice, difficulties soon presented themselves that were of a nature not readily overcome. In the line of first importance was the problem of regenerating the used black, and incidentally the difficulty of finding some adequate machinery for handling large quantities of such a dusty, inflammable, and en mass, highly immobile material. Of course Eponite must be regenerated, otherwise its cost would be prohibitive as far as sugar refining is concerned.

Experimental lots of Eponite were revivified in a small cylindrical iron retort, by heating the material to a dull red heat—800 deg. F.—for half an hour. Strange to say, the regenerated Eponite has a higher decolorizing power than the crude material, as illustrated by the following figures:

Raw Eponite reduced the color of a sugar solution 85.18%.

Regenerated Eponite reduced the color of a sugar solution 90.88%.

As all experiments were run on a fixed standard, these two results were strictly comparable, and therefore, the anomaly of the used and regenerated Eponite being more powerful than the virgin black had to be explained.

The next step in the study of this black cleared the matter, and in fact refers to all blacks of this nature.

The raw Eponite suspended in water gave a distinct alkaline reaction to the liquid, and this was to be expected, since, according to the analysis of the ash, 60% of it consisted of lime and potash and only a little over 2.5% of the phosphoric radical is indicated. It is an old established fact that sugar solutions can best be decolorized after the liquid has been brought to a neutral or acid reaction. Furthermore, the presence of phosphates, as will be seen later, enhances the decolorizing power of most blacks.

Now the Ratibor firm, though anxious to secure recognition of their product as a practical decolorizing agent, did not appear able to aid in the question of modifying or regenerating of their black. The Carbon Werke, however, suggested leaching out the free alkali with water, but this was tedious work at best. Therefore, on theoretical and practical grounds, the raw Eponite, or rather its alkaline salts, were neutralized with phosphoric acid. Hence the greater efficiency of the used Eponite as noted above.

Concurrent with the laboratory work, practical tests were being made, and although as far as decolorizing results were concerned, very satisfactory data were obtained, progress on the problem of handling and regenerating the black was at a standstill and the general conclusion was that Eponite might be with advantage modified in its physical structure without prejudice of its chemical efficiency. This gave rise to the question: What is Eponite?

Producing Eponite From Peat.

Inferencially Eponite was a by-product from the manufacture of a paraffin-like wax, Cerasin. The Carbon Werke, it was understood, were extracting this Cerasin from peat. Eponite, undoubtedly, is a soot, but when compared with ordinary dull lamp-blacks of the market, it had a distinctly lustrous appearance, and therefore doubt arose as to the correctness of Dr. Strohmer's description of Eponite. Up to this time it had been accepted upon his authority. With the expectation, then, that some information might be forthcoming, a microscopic examination was made. The result was surprising; instead of a dull, lustreless agglomeration of soot particles, the black, under an amplification of 200 dia., was seen to be composed of innumerable, fine, needle-shaped plant tissues, richly covered with nodules of microscopic carbon masses. Of course, the tissues were charred, but were quite distinctly constituents of the black. Clearly, then, the characteristics were most striking and the word "amorphous" could hardly be applied with justice to a substance in which the structure of the plant tissue could be so readily seen. Without doubt, Eponite was proved to be no homogenous substance, as would be inferred from Dr. Strohmer's description.

The characteristic dispersion of the carbon particles upon the tissues was kept in mind, and later lead to the idea of the advantage of adding an inert substance to, not only Eponite, but to any sooty black for the double purpose of, on the one hand facilitating the manipulation, and on the other hand to still further improve the decolorizing effect.

Having come to the conclusion that Eponite is nothing more than an exceptionally fine soot, the next question was: From whence this unique distinctive character?

Evidently an attempt at the manufacture of Eponite was next in order. As it was known that Eponite was either a direct or a by-product of the Ratibor firm's operation on peat, a brick of dry peat was therefore procured, rasped

*"Sugar," April, 1917, page 141; also "International Sugar Journal," July, 1917, page 306.

to a coarse powder, heaped upon a finely meshed iron screen, above which several lengths of ordinary stove-pipe was fixed. Above the stove-pipe an ample bell-jar, with tubular opening at the top was placed. The pile of rasped peat was ignited and kept burning at the edges so that the smoke passed up through the pipe and soot was deposited inside of the comparatively cool bell-jar. At the conclusion of the experiment about a teaspoonful of soot was secured from the jar. This soot was placed under the microscope; portions of it was submitted to all decolorizing, physical and chemical tests that had been applied to Eponite. The laboratory product responded affirmatively to every test, and therefore proclaimed itself true Eponite. Evidently, then, Eponite is a soot product, and though it be regarded as such, the mode of its production—if the experiment be accepted as a demonstration—suggested a new line of investigation in the manufacture of decolorizing blacks. For instance, by the destructive distillation of cocoa-nut shells a very powerful decolorizing black is produced; but what would happen if, instead of the complete destruction of the tissues, the shells were first ground and an endeavor made by this means to produce a product, a black similar to Eponite?

In passing it may be stated that of all the blacks examined—and not excluding ordinary lamp-black—Eponite has the lowest apparent specific gravity. Apparently here is a promising field and a likely line of departure from the conventional production of these and similar blacks.

The usual line followed in black production is to seek dispersion of the carbon particles by mixing the carbon yielding material with lime, Kaolin, diatomaceous earth and the like. But if the burning of plant tissues be the base of carbon production, the cost of these dispersion inducers may be avoided and the partial destruction only of the tissues may, indeed, prove efficaceous.

But to return to the main theme. Having learned the structural nature of Eponite, it was decided to modify the black and also to experiment with the view of producing a black of similar nature for further information. Reviewing the efforts at a new black production first, that may be briefly disposed of in saying that with a few exceptions the experiments were neither original nor successful—or to put it in another way, when successful they were not original and when original they yere not successful.

However, a great many substances were experimented with, among them were saw-dust, blood, peas, peat, bone-oil and paraffin. These, and mixtures of them, were decomposed by heat under varying conditions, and in some cases the mixtures were treated with HCl, H_3PO_4, or NaOH. Again, heating under pressure—up to 200 pounds—was assayed, but no encouraging results obtained.

Experimental Production of a New Black, "Karbos."

In the face of these failures there still remained an old standby, viz., the purified animal black of years ago. But the one great objection to the use of dusty or sooty blacks is that they all tend to very soon clog the filter-presses used for filtering out the black after it has done its work as a decolorant. Usually, as soon as the pressure of the liquor passing through the filter-press reaches, say, 30 pounds, the flow diminishes and the press has to be cleaned. Raising the pressure only makes matters worse and further helps to press the layer of black into a still more impervious cake. But the significance of the acicular plant tissues found in the Eponite was here applied and some charred saw-dust was mixed with prepared carbon from decomposed char-dust, or even ground discard char from the refinery. The result was highly satisfactory; a decolorizing black was now at hand fully as efficient as Eponite and having none of its objectional features.

Raw and charred saw-dust are proverbially excellent press filtering media, and as fully 50% of charred saw-dust could with advantage be mixed with animal carbon another purpose was also served, viz., the immobility of the new black was much less marked, indeed, so much so that there was every promise that heat regeneration would be possible in a somewhat modified char-kiln. This new black, therefore, had specific features, and was placed among its competitors under the name of KARBOS. Furthermore, Karbos proved such an excellent filtering medium that upon one occasion an experimental run through a filter-press not only filled the press with Karbos, but also a foot of the feed-pipe and still the press kept running freely.

Preparation of Standard Karbos.

Karbos is prepared by digesting one kilo of 100 mesh char-dust with 1250 c.c. 18 deg. Beaume commercial HCl for 20 hours. The resulting pasty mass is then worked up with 23 litres of water and 70 grams charred saw-dust added, and the whole agitated by an air current or by mechanical means and filtered as rapidly as possible. The resulting black is then washed with two batches of water of 23 litres each, the first batch being retained to dilute a subsequent lot of paste, while the second is run to waste, as it contains practically no phosphates. The large quantity of water is necessary as otherwise "reverted" phosphate deposits upon the black, reducing its efficiency. The phosphate liquor filtered from the Karbos has a density of from 7 to 8 deg. Be., equal to 13 to 14 per cent superphosphate and may serve as a defecating agent or may be concentrated and sold as superphosphate of lime.

Success with Karbos again brought the interest of modifying Eponite to the front and it was thought that perhaps a little more of a good thing might be better, and, therefore, acting upon this belief, 30 to 50 per cent of charred saw-dust was mixed with Eponite, thus increasing the plant tissue in the black and offering a larger surface to which the elementary carbon could adhere and thus, by securing a greater dispersion of the amorphous carbon particles, increase their aggregate efficiency. Decolorizing experiments made with such modified Eponite demonstrated that the Eponite in the mixture had increased its efficiency by something like 25 per cent.

In closing this part of my paper, I must take occasion to acknowledge the very efficient and accurate work done by my former chief chemist, Mr. Harold Wood. Not only did Mr. Wood carry out most of the experiments, but he also gave valuable suggestions as the investigations went forward.

As Mr. Wood drew up an independent report on the use of charred saw-dust in decolorizing blacks, some quotation will here be pertinent.

Functions of Charred Saw-dust. "Some of the conclusions relative to these functions were reached from time to time as our experiments with Karbos and other blacks were extended by various incidental experiments, and therefore the discussion in this respect does not chronologically follow the order in which these advantages and functions became apparent."

"These functions and advantages, then, of charred saw-dust as a rationally applied constituent of Karbos may be considered under several heads.

A. "As facilitating the filtering properties of a black.

"The superior filtering capacity is quite pronounced, as

blacks such as soot, carbon from bone-black, and even comminuted charcoal, tend to clog the filter press blankets in a very short time and make the filtering operation tedious and costly."

B. "As to reducing to a marked extent the dusty nature of the black."

C. "As to rendering the black more mobile.

"This is a very important advantage when the black is being handled for purposes of regeneration, and in other steps of its preparation. The added chardust will then cause it to flow through a slightly coned retort and it can be, moved on conveyors without cloggy or serious agglomeration."

D. "As to its tendency to cause the black to cling less tenaciously to the filter blankets.

"Eponite, soot and bone-carbon enter the pores of the cloth and cannot readily be washed out. Karbos forms a porous cake, which is easily removed from the blankets, leaving comparatively little on their surfaces."

E. "As to the possibility of partially drying by pumping warm air through the filter presses.

"Water content of Karbos cake has been reduced to 35 per cent in practice, and may no doubt be obtained still drier by proper appliances."

F. "As to increasing the efficiency of the 'active black' in the Karbos.

"This function was experimentally determined by varying the proportion of 'active black' in sundry blacks prepared. Charred sawdust may be considered as practically inactive as a decolorizing agent."

"It was observed that when the decolorizing efficiency of a black was figured back upon the percentage of 'active black' present, this latter was more pronounced or reached its maximum when a certain proportion of charred sawdust was present.

"Eponite was thus improved by adding to it a quantity of charred sawdust.

"This phenomenon was explained by considering that the tissues of the charred sawdust act as distributing media of the carbon particles on their surface, keeping 'active black' well segregated so that no agglutination takes place, and each particle, or more particles than otherwise, are enabled to come in contact with the fluid to be decolorized."

Chemistry of Decolorizing Blacks.

Perhaps the most direct way of introducing a short discussion on the chemistry of decolorizing blacks may be by drawing the attention of those who may be interested in this matter in further detail to an article in the Journal of our Society of April 28th, 1903, page 608.

In this paper that author, T. L. Patterson, F.C.S., treats on "The Carbonaceous Matter of Animal Charcoal."

The presence of the elements H, N, and O in char has been recognized since 1850, or thereabouts, but for a time it was inferred that these elements, as such, were held as occluded gases. As a matter of fact, char does occlude almost any gas. Patterson, however, was the first, as far as the writer knows, to demonstrate that the "Carbon" usually reported in char analysis is really composed of carbon and a carbonaceous complex containing, besides Carbon, also H. N. and O. Indeed, Patterson states that "the combination in which N exists in animal charcoal has not hitherto been investigated."

The so-called "carbon" in animal charcoal is usually determined—details of method not considered—by dissolving the calcium phosphate and other salts of the char in hot HCl, washing out with water, drying and weighing the residue. The residue is incinerated and the combustible part is reported as Carbon. Now the so reported carbon is not the element carbon only, but a mixture of carbon and a nitrogenous body of the empirical formula C H N O. Ultimate analysis shows it, in round percentages, to contain C 63, H 4, N 12, and O 21 per cent.

Patterson extracted this—let us call it "Nitro-body" for convenience—from the, in HCl insoluble residue by digesting it in cold H_2SO_4. Upon diluting the H_2SO_4 with water, the nitro-body is obtained as a dark brown, flocculent, gelatinous precipitate. A second extraction with hot H_2SO_4 takes out a further quantity of the same body, or a very similar one.

Patterson's char investigations, as set forth in the paper, are devoted to the discussion of many interesting viewpoints in char chemistry, but confining ourselves to the nitro-body, there is this important practical feature about it, that it possesses a very high decolorizing power when it is allowed to react on caramel and sugar solutions without destroying its gelatinous condition. According to Patterson, this nitro-body in its original suspension will decolorize 17.43 c.c. caramel solution, which makes it 16 times better a decolorizer than good charcoal. But if the nitro-body be dried and then ground and applied in this state as a decolorant, its power falls to 10.0% below that of standard charcoal.

The practical importance of Patterson's work lies in this, that he has shown that this nitro-body gradually disappears under repeated reviving of the char. Virgin char may contain as much as 2% of the body (the author has found as much as 2.8%), but a char that has been in use eight weeks contained only 0.3%, while in a discard char the percentage had fallen to 0.04%.

There are a great many other interesting features connected with this nitro-body, and some of them are discussed by Patterson. It is a matter of regret, however, that no study was made relative to the comparative decolorizing power of the nitro-body and the denitrogenized carbon from which the nitro-body has been extracted. Such an investigation would have been of immense value from a theoretical as well as a practical point of view. Probably a few experiments in this direction might have answered the significant question: Which in the char has the greater decolorizing power, the elementary carbon or the nitro-body?

Although this review of decolorizing blacks is necessarily quite incomplete, it may be considered that in so far as has been pointed out, not more than two classes of decolorizing blacks are at the disposal of industry to-day.

In the first class animal black stands as the only representative and is without a rival.

In the second class may be placed all those dusty, sooty, highly comminuted blacks, among which Eponite may be regarded as typical. As has already been remarked, the general effort toward the commercial production of this class of blacks is to mix vegetable organized material with some such substance as lime, clay, etc., which all, in a manner, act as dispersive agents for the carbon particles. The action of these dispersive agents may be regarded as analogous to the function of the bone tissue in animal black.

Two of the latest efforts in the production of decolorizing blacks used, in the one case dried peat, and in the other the needles of coniferous trees. Lime and soda are mixed

with the organized base and the whole calcined at a temperature of from 500 to 2,000 deg. F.

Still another black, called "Carboraffin"—present cost, $350.00 per ton—is made by mixing peat, etc., with a concentrated solution of ZnCl, the mass is further concentrated and finally heated to 700 deg. F. The Zn is washed out with water and HCl.

Lastly, we have "Molasocarb," made by decomposing low purity molasses with lime, and the final operations are similar to the other blacks described.

Clearly, then, we have at hand to-day a super-abundance of decolorant blacks, most of which, under proper manipulation, may serve some practical purpose, more particularly, perhaps, where comparatively small volumes of colored solutions require decolorization—aqueous extracts, for example—but the next urgent need is a thorough study of their physical and chemical properties.

In order to be able to determine the relative value of decolorant blacks, they must all be tested under some standard method. The generally loose statements as to their specific power are either valueless, or what is worse, misleading. A black may do wonderful work, but can it be readily revived, and how often, is quite as important.

In the writer's opinion, the next line of progress should be to find a specific or general dispersive medium which will enable each particle of the decolorizing carbon to exercise its full function.

If, let us say, charred sawdust should prove to be such a dispersive medium for the minute carbon particles of active black, i.e., the only part of the black exercising a decolorizing power, it seems probable that the study of decolorizing phenomena of these products will be made more definite. This belief is strengthened by the fact that similarly conducted tests did not always give quite concordant results at first, and the trouble was traced to the method of adding the decolorant to the solution under examination. This refers more particularly to blacks of the Eponite type. When no dispersive material is added to such blacks there is a tendency of agglomeration and the full power of the active black cannot be exerted, or, again, agglomeration may be more pronounced in one experiment than in another.

Again, in a black like Karbos, it was observed that the extent of the comminution of the char dust used had a marked influence on the final decolorizing power of the finished black. Thus powdered char passed through 60, 80, 100 or 200 mesh sieves proved successively more powerful decolorants as the comminution was increased.

The product from the 200 mesh was distinctly more powerful than any of the others.

And in closing it may be remarked that comparative claims of the power of a black are almost invariably cast upon an entirely erroneous basis. The practice seems to be to compare a black weight for weight, while comparison should be based upon the active decolorizing base in the particular product under examination. As an illustration, when char is taken as the unit of comparison, it is frequently stated that such and such a black has 5, 6, 10, yes 20 times the decolorizing power of char, forgetting that the black of high power simply owes that quality to the fact that it may contain 5 or 6 times more active black than the char with which it is compared.

FRUIT SYRUP PLANT AT ST. JOHN, N.B.

The Murray Co. of Canada, representing the Murray Co. of Boston, have taken over the plant of the Wilson Chemical Co., St. John, N.B. The new company proposes to increase the production of fruit syrups formerly manufactured by the late company.

WHAT IS A CHEMICAL ENGINEER?*

By DAVID WESSON.

On occasions like this precedent seems to have decreed that your President should make some kind of an address. Personally it has been a matter of debate in my mind whether an address or a sermon was the better sedative.

If it were proper for me to deliver a sermon, I would take for my text 2nd Corinthians, 3rd chapter, the last part of the 6th verse, which reads as follows: "Not of the letter of the law, but of the spirit, for the letter killeth, but the spirit giveth life." The reason for choosing this text was brought to my mind when discussing the proposed amendment, which has brought more or less discussion among our members, and not having received the necessary two-thirds vote of the members, has failed to pass. I am free to admit that there seemed to have been a good reason for the amendment when it was first proposed, but after going into the matter fully with the Chairman of our Membership Committee, have concluded the amendment is unnecessary.

Those who have not served on the Membership Committee cannot fully realize its importance, and the great care its members take to do justice to all applicants and at the same time to see that the high standards of our membership are maintained. I have served on a jury and I have served on the Membership Committee, and between the two would choose the latter if I desired to obtain a thorough impartial sifting of evidence.

No name is allowed to go on a ballot without a careful consideration by the Committee of a man's qualifications and references. The greatest attention is paid to the applicant's character and ethics. Many cases come up where there is no question about the worth of a candidate and little time is lost in putting his name on the ballot. Other cases come up where the applicant obviously wants to use the institute for selfish or advertising purposes, or is fully unqualified, and it takes no time to turn him down.

The greater part of the time of the Committee is taken up in deciding on the cases which come on the border line, and they are many. They require, often, long and patient investigation before the applicant can be either turned down or accepted. When a name goes upon the ballot for membership we can all rest assured that it is only after a careful investigation, and if there is any reason why an applicant should be rejected, it is the duty of members knowing such reason to vote against him and put the reason in writing. This brings out another investigation by the Committee, which reserves decision until the evidence is all in and carefully weighed.

The Institute owes its high standing to its Membership Committee, probably more than any other factor. It is an honor to be elected to the Institute and the Membership Committee try and make it their business to see that applicants for membership will likewise add to its lustre if elected.

Maintaining a High Standard.

The Institute, as you know, was started in 1908, just twelve years ago. Our membership at present is about 400. Up to six months ago our growth was about 24 members a year. During the past six months we have added 40 or 50 members. It seems desirable that we should increase our membership to about 600, which would be nearly double

*Address delivered by David Wesson, President of American Institute of Chemical Engineers, at the Montreal meeting, June 28, 1920.

what it was a year ago. We must bear in mind, however, that quality of membership is to be desired rather than quantity, and we must not lose sight of the fact that it is possible to have a society so large that it will defeat the object of sociability among its members and make delightful excursions such as we have had in the past and such as the present one impossible from mere weight of members. It should be our object, therefore, in the future, to try and secure for members those who will add to the prestige of the Institute.

In the selection of new members, we should be governed by the text already quoted. There has been in the past more or less adverse criticism because the membership rules were some times too narrowly applied. It was some such feeling which probably started the proposed amendment which has just been rejected. I think the whole trouble has arisen from a misconception of what constitutes a chemical engineer.

What the Dictionary Says.

The Century Dictionary, of 1909, says: "Chemical Engineer—a degree given to graduates of a Technical or Engineering School for special knowledge of the scientific laws and rules of practice concerned with the manufacture of chemical products." It is evident that if many of us applied this definition to ourselves we would find we had never taken the degree, although we were admitted to the Institute without it.

The 1900 edition does not mention Chemical Engineer at all, but gives us a third meaning of the word "engineer" —"One who carries through any scheme or enterprise by skill or artful contrivance—a manager." The Chemical Engineer, therefore, is in the broadest sense of the word a Chemical Manager, that is, one who manages enterprises requiring the knowledge and application of chemistry. In a broad sense the head executive of a successful chemical enterprise, although not a trained chemist, might be a better chemical engineer than some man in his works who, though holding the degree of Chemical Engineer, would never rise above the position of foreman or superintendent of some small department.

Again, the editor of a Chemical Engineering Journal, though not practicing chemical engineering, so called in its narrow sense, at the time of his application should, if possessed of the proper education and experience, be eligible to membership. The same rule would apply to a chemist who had turned his attention to patent law and was rendering great service to applied chemistry in securing patent protection to the industries.

Narrow Ideas Not Wanted.

We must not be too narrow in our ideas as in the case of the two school chums, Bill and Joe, who grew up and became one a Baptist and the other an Episcopal clergyman. One Sunday Joe visited Bill, who was the Parson of a flourishing Baptist church. Bill invited his old chum to preach to his congregation, which he did in a very able manner. During the hymn after the sermon, Bill and Joe put their heads down below the top of the pulpit to talk things over. Bill congratulated Joe on his fine sermon, but said he greatly regretted that he could not ask him to take communion, which was about to follow, because Joe had not been baptized. "Never mind, old man," said Joe, "I could not take it from your hands anyhow, because you have not been ordained a priest."

In conclusion, I want to say that it is believed that the Institute should have in its membership the leaders of all branches of chemical industry; we should not wait for them to apply for membership, but should go after them. We need them and they need the Institute. The old theory that we should wait for men to apply is exploded. Many of those who apply naturally are undesirables. We have it in our power to help the Institute by selecting the right sort of applicants ourselves and inducing them to join.

Let us all consider ourselves members of a committee to add about two hundred desirable members to our roll between now and the next meeting. If each one of us brought in only one member, our membership would be doubled. If only half of us succeed in landing desirable members, we will make a very respectable showing, which, in my opinion, will add greatly to the strength of the Institute.

SYNTHETIC CAMPHOR.

The world's camphor is virtually all obtained from the laurel camphor tree, *Laurus camphora*, of Japan, though the compound is contained in small amounts in some other plants. Recent increased demand and lessened production have aroused concern for the future supply, for the camphor is extracted by the action of steam on the trunk, roots, and branches, the tree being destroyed, and growth of new plantations requires 100 to 150 years. Interest in synthetic camphor being thus revived, Professor Mailhe, a French chemist, notes that it is prepared quite simply in three steps from the pinene of the essence of turpentine. Gaseous hydrochloric acid converts the pinene into a solid hydrochlorate, and this is changed to camphene by ammonia, pyridine, or any one of many methods. The camphene is hydrated into borneol by heating in a water-bath with glacial acetic acid and about two per cent of sulphuric acid. The borneol is transformed into camphor by oxidation by air, oxygen, ozone, or other agent; or by dehydrogenation by passing the borneol vapor over finely divided copper heated to 300° to 330° C., thus splitting the compound up into hydrogen and camphor. The success of this artificial camphor may depend on a lowering of the present high cost of turpentine and hydrochloric acid.—*The Chemical Trade Journal and Chemical Engineer.*

GIFT TO DALHOUSIE UNIVERSITY.

At the meeting of the shareholders of the Dominion Steel Corporation, held at Halifax, July 15, at which the Corporation ratified the proposals to merge their company in the $300,000,000 British Empire Steel Corporation, President Roy M. Wolvin of the Dominion announced that the British Empire Steel Corporation had made a gift of $250,000 to Dalhousie University. The donation, he stated, was to be used for the purpose of providing professorships in research work in connection with the development of the natural resources of the Province of Nova Scotia.

As regards the merging of the steel companies, Mr. Wolvin stated that the vote of the Dominion shareholders was unanimously in favor of it. Of the vote polled, 298,000 shares, there was not a dissenting vote. The Nova Scotia Steel and Iron Company has already accepted the plan, and the Canada Steamships Lines, the Halifax Shipyards, and several smaller companies will, it is confidently expected, shortly follow.

ARTICLES EXEMPTED FROM SALES TAX.

In the list of articles exempted from the "Tax on Sales," recently levied by the Canadian Government, appear the following: Milk products, oleomargarine, butter, cheese, lard, coffee, tea, sugar, molasses, maple, corn and cane syrup, gold and silver ingots, anthracite and bituminous coal, lignite, briquettes made from anthracite or bituminous coal or lignite, charcoal, peat, wood for fuel purposes, electricity, calcium carbide, gas manufactured from coal, calcium carbide or oil for illuminating or heating purposes.

American Chemical Engineers Visit Canada

Twelfth Semi-Annual Meeting of the American Institute of Chemical Engineers Held on Canadian Soil.

For the first time since its organization, in 1908, the American Institute of Chemical Engineers held their summer meeting in Canada, when from June 28th to July 5th, nearly one hundred and fifty members of the Institute and their ladies visited Ontario and Quebec. The opening sessions were held in Montreal on Monday, June 28th and Tuesday, June 29th, when business meetings were held and technical papers presented. Following the Montreal meetings the members and their guests left on a six day's industrial tour of Eastern Ontario and Quebec, which equalled if not surpassed anything of a chemical nature ever held in the Dominion. Leaving Montreal Wednesday morning by special Canadian National Railway Pullman train, the places visited were Ottawa, Belleville, Deloro, Madoc, Corbyville, Shawinigan Falls, and La Tuque. After leaving the train at St. Alphonse, Sunday morning, July 4th, the journey was continued by Canadian Steamship Line steamer down the beautiful Saguenay River and up the St. Lawrence to Quebec City, where after visiting the many historic points of interest on Monday, the party finally broke up.

The trip was a wonderful success from first to last, and its success is in no small way due to the kind and untiring offices of Mr. C. Price-Green, Commissioner of the Industrial and Resources Department of the Canadian National Railways, who was in charge of the party during the four days that they were transported on the National "Special." That the American chemists who made the trip are to-day possessed of much better appreciation and knowledge of the chemical and allied industries of Canada, as well as of the scenic beauties and natural resources of Eastern Ontario and Quebec, is an undoubted fact.

The Executive of the Institute were in close co-operation with Mr. Price-Green throughout the journey to make everything come off on scheduled time and in smooth working order, and though much of the trip was through more or less rough and almost unbroken country, it must be said that everything was done to facilitate travelling conditions, and to bring the party into Quebec City on time. The members of the Executive present were: President, David Wesson, Manager, Technical Department, Southern Cotton Oil Co.; Vice-Presidents, Henry Howard, Grasselli Chemical Co.; A. W. Smith, Professor of Chemistry, Case School of Applied Science, Cleveland, Ohio; Hugh K. Moore, Chief Chemist, the Brown Corporation, Berlin, N. H.; Secretary, John C. Olsen, Professor of Chemical Engineering, Polytechnic Institute, Brooklyn, N. Y.

Monday and Tuesday, June 28-29.

Business session opened in the Hotel Windsor, Montreal, President Wesson presiding. After routine business had been despatched, the matter of increasing the membership was discussed at some length. The present membership is four hundred, but President Wesson felt that the Institute could be of more service to engineers were the membership increased to at last six hundred. Some members objected to making any large increase and pointed out that as the Institute set a very high standard of qualification for membership, that these qualifications should be strictly maintained, and that it would be unwise to in any way solicit memberships. Dr. Olsen doubted if there were over six hundred fully qualified chemical engineers in the United States who could become active members of the Institute. President Wesson declared that he would not for a moment lower the standard of entrance into the Institute, but that he was convinced that there were many chemists who, if they only knew about the Institute, would seek admittance. Mr. Wesson was supported in his view by several speakers, and it was shown that by personal contact the members could quite easily increase the membership by the "each bring one" method. Dr. Langmuir hoped that the Institute would never be as large as the American Chemical Society, where at convention sessions sectional meetings were necessary, and the constant going back and forth of delegates from one section to another was, he thought, a decided disadvantage which a smaller body escaped. On the whole, however, it would seem that while none favored lowering the standards, or unduly soliciting members, yet the majority present concurred with the President. The members were welcomed to the City by Commissioner R. A. Ross, President of the Engineering Institute of Canada, who, at the same time, added to the civic the welcome of the Engineering Institute.

The members were then treated to a symposium on electrolytic cells in which Mr. C. B. Barton, of the Brown Corporation, gave an excellent paper on "Early Commercial Electrolytic Cells." He gave an account of the pioneer work done at Rumford Falls, Maine, 1894-98, by Le Sueur, Macdonald, and Mercer. The first electrolytic cells, stated Mr. Barton, consisted of bell jars with gas carbons set in lead. The cells were in parallel, the various tanks in series, and the diaphragm had to be changed very often. In 1894 the type was changed, the cells being constructed of boxes 24 in. x 24 in. x 24 in. deep with slate tops and asbestos paper diaphragms. Wire netting was placed in contact with the cell bottom and connected to the cathode, the anode being of retort carbon. The object of this arrangement was to bring the anode close to the diaphragm; five hundred cells of this type were put into operation at Rumford Falls, but were soon discarded. The third type consisted of a slate box 36 in. x 6 in. x 18 in. deep, and was somewhat similar to the second type. The fourth type was a large unit 9 ft. x 5 ft. x 18 in. deep, with wooden bottom frame and iron gird ⅜ in. x 1½ in. bolted to tank bottom. The cathode support was slightly inclined to facilitate the escape of gas; the cathode proper was covered with asbestos diaphragm. Fifty of these cells were installed at the Brown plant and differ from the present cell only slightly. The present cell (the Allen-Moore) has a perforated gird.

This completed the morning session, following which luncheon was taken in the Blue and Oak Rooms, Hotel Windsor. In the afternoon, through the kindness of the Montreal local committee, of which Mr. Wm. B. Campbell and Mr. R. H. Monk were active members, and the Engineering Institute, the sessions were transferred to the lecture hall at the Engineering Institute building. 176 Mansfield Street, where much better accommodation for the giving of papers was secured. On Monday afternoon and Tuesday morning several splendid papers were presented,

those by W. L. Badger, P. W. Shepard, and E. M. Baker, dealing with Temperature Drop and Hydrostatic Head and Heat Transmission in vertical tube evaporators, and by Dr. W. D. Richardson, of Chicago, on "Experiments on the Corrosion of Iron and Steel" and on "Rates of Solution of Iron and Steel in Non-Oxidizing and Oxidizing Acids," and that on "American Progress in Dendro Chemistry," by H. O. Chute, of New York, being especially interesting and of extremely high value.

Apart from the papers the chief features of the convention in Montreal were the annual dinner on Monday evening, an informal and very happy affair, and the smoker or "Section Q" on Tuesday evening. On Tuesday afternoon the members were shown through the glycerine plant of Marx and Rawolle, Ltd., which proved a very attractive and interesting event. Dynamite, and commercial and chemically pure glycerine are produced. About 3,000,000 lbs. of glycerine are produced per year. The plant of the Canada Malting Company was also inspected, where brewers malt is made from barley, which after fermenting in large tanks, and sprouting, the starch is converted to glucose and maltose and then dried.

Wednesday, June 30.

On Wednesday morning the party boarded their special "Canadian National" train at 9.15 for Ottawa, arriving in the Capital City at 1 o'clock, where they were met by a number of the Ottawa members of the Canadian Institute of Chemistry and of the Society of Chemical Industry, including Edgar Stansfield, Dr. Frank Shutt, S. J. Cook, Dr. Eugene Haanel and E. Le Sueur. The Ottawa chemists proved themselves a "live bunch" and assuredly deserve credit for the hearty welcome they gave the visitors as well as for the excellent arrangements they had made for their entertainment while in the city.

Immediately on leaving the train the guests were conducted to the Chateau Laurier, where they were tendered a dinner by their Ottawa hosts. Dr. Edgar Stansfield, of the Mines Branch, was Chairman, and seated at the head table with the Executive of the American Institute were, Sir George Foster, Minister of Trade and Commerce; Mayor Fisher, Dr. Frank T. Shutt, Charles Camsell, of the Mines Branch, and John Bingham, President of the Ottawa Board of Trade. Following the dinner addresses of welcome were delivered by Sir George Foster, Mayor Fisher, Mr. Bingham, Mr. Camsell and Mr. Cook. Sir George Foster was the principal speaker, and extended the welcome of the Dominion Government to the American chemists. President Wesson, of the Institute, replied for the visitors, and referred particularly to the good feeling that to-day existed between Canada and the United States, largely as a result of the two countries having stood together in the war. He was sure that the engineers were quite overwhelmed by the splendid reception Ottawa had given them.

Following the dinner the members were taken by special street cars across the Ottawa River to Hull, where an inspection of the E. B. Eddy Company's plant was made. The inspection of the plant was carried out in a systematic manner. The party was divided into two groups. Group A visited the Sulphite Pulp Mill, and Group B the Paper and Indurated Fibre Plants. Each group was sub-divided into parties and separately conducted by guides through the different buildings. The guides were truly the "real thing" in guides, and were only too willing to explain everything possible. The acid plant and digester house proved exceptionally interesting, in the former acid calcium sulphite being produced for use in the digesters in the Digester House, where the pulp wood chips are digested under pressure with a solution of acid calcium sulphite. The Indurated Fibre Plant was also very interesting and novel to many of the visitors. In this plant mechanical ground pulp is beaten, sized and moulded, dried and then indurated for the making in the same plant of buckets, tubs, washboards, and pails of different types, the well-known Eddy fire-bucket being one of these. The present output of the plant is approximately:

Sulphite Pulp—55 tons per day.

Wood Pulp—100 tons per day.

Manufactured Paper—120 tons per day.

Grocery Bags—1,000,000 per day.

Toilet Paper and Towels—325 cases per day.

Indurated Fibre Articles—500 pieces per day.

On completing the journey through the plant, motor cars were awaiting the visitors and drives were taken through Rockliffe Park along the Ottawa River, bringing everyone back to the train in time for "all aboard for Belleville." Leaving Ottawa at six o'clock, Belleville was entered at midnight, but were the good people of this city asleep? We should say not. A military brass band and a large crowd of citizens welcomed the guests at the station and a parade was formed of the engineers, their ladies, and citizens to the splendidly appointed and well equipped Hotel Quinte, where Acting-Mayor Ponton and Captain Lucius Allen, the latter a Belleville member of the Institute, welcomed the party to the city.

Thursday, July 1st.

Dominion Day was a busy one for everyone. Motor cars, provided by the citizens of Belleville, conveyed the visitors on an eighty mile tour of Hastings County, passing through Marmora, where the local band gave the village greetings, thence on to Deloro, the home of the Deloro Smelting and Refining Co., Ltd. Here a dinner that tasted mighty good after the motor drive was served by the Company in the local concert hall. Manager S. W. Wright, of the Smelter, welcomed the guests to Deloro and invited all to an inspection of the plant, which was carried out immediately following luncheon. Every part of the plant was inspected and the processes well explained by company guides. High-grade silver-cobalt-nickel ore is treated, recovering silver, and cobalt and nickel oxides, and also the metals cobalt and nickel. Perhaps the most interesting feature was the making of the alloy "Stellite," a large amount being made here for the Haynes Company, of Kokomo, Ind. Machinery is now being installed at Deloro for the making of cutlery out of Stellite, and as Stellite is very hard and stainless, there is no need for sharpening or polishing, and it would seem that cutlery from such material would have a decided advantage over the ordinary steel ware.

Leaving Deloro by the motors the next stop was at Madoc, where the talc grinding mill of the G. H. Gillespie Company was inspected. The talc is secured from the mines nearby and put through several series of grinders until the final product is a beautiful pure white talc, already favorably received and well known to the trade. The large and modern plant of the Canadian Industrial Alcohol Co., Ltd., at Corbyville, was visited next. Here W. G. Hume, the Plant Manager, Geo. Appell, Chief Chemist, and their assistants, conducted the engineers through the entire plant. The plant produces alcohol for industrial purposes practically altogether now, though distilling for beverages has not been stopped definitely. A large addition is being

American Institute of Chemical Engineers, Hotel Windsor, Montreal, June 29, 1920.

1. A. C. Langmuir
2. Richard K. Meade
4. Hugh K. Moore
5. J. R. M. Klotz
6. J. T. Baker
7. W. C. Bainbridge
8. Mrs. C. Sundstrom
9. P. F. McCleary
10. E. W. Wiggins
11. Mrs. A. B. Conner
12. Edgar Stansfield
13. J. F. Clark Carnell
14. J. V. N. Dorr
15. W. B. Campbell
16. Mrs. W. B. Carnell
17. W. C. Carnell
18. W. R. Clymer
19. Mrs. Ethel Takamine
20. G. H. Dorr
21. Earl Durfee
22. Jokichi Takamine
23. A. D. Chambers
24. E W. Tucker
25. Mrs. E. Durfee
26. Benjamin T. Brooks
27. Clarke E. Davis
28. N. C. Ortved
29. Mrs. C. B. Clark
30. Arthur Wright
31. Parker C. McIlhiney
32. C. R. Bellamy
33. John C. Olsen, Secy.
34. Mrs. David Wesson
35. David Wesson, Pres.
36 Ralph H. McKee
37. Mrs. Benjamine T. Brooks
38. Mr. Bellamy, Sr.
39. E. C. Holton
40. D. H. Litter
41. Clarence W. Marsh
42. P. C. Kingsbury
43. C. B. Clark
44. B. R. Tunison
45. John B. Howard
46. Mrs. Henry Howard
47. Henry Howard
48. H. O. Chute
49. Mrs. J. H. Dunbar
50. Thomas C. Howard
51. J. H. Dunbar
52. Mrs. A. W. Smith
53. Charles S. Hollander
54. D. S. McAfee
55. A. W. Smith
56. Mrs. A. D. Chambers
57. W. L. Badger
58. A. E. Marshall
59. Joseph W. Richards
60. V. C. Edwards
61. S. L. Tyler
62. Mrs. G. M. Davidson
63. G. M. Davidson
64. R. S. Sherwin
65. Mrs A A. Bartow
66. A. Guillaudeu
67. E. B. Miller
68. J. D. Kerr
69. A. C. Houghton
70. S. F. Grove
71. Mrs Beck
72. H. H. Meyers
73. W. H. Gesell
74. Mrs. A. M. Comey
75. A. M. Comey
76. Walter Laib
77. F. H. Garner
78. C. C. Ahlum
79. L. D. Simpkins
80. Mrs. A. H. Hooker
81. Louis J. Matos
82. W. W. Rhodes
83. F. C. Zeisberg
84. Mrs. W. C. Bainbridge.
85. Samuel P. Sadtler
86. T. L. Lyster
87. Edward Bartow
88. Miss A. Seeker
89. Harlan S. Miner
90. Joseph Maudru
91. G. P. Hahlweg
92. Mrs. W. H. Gesell
93. E. F. Buchanan
94. R. W. Shafler
95. Mrs. G. A. Prochazka
96. S. P. Miller
97. C. A. Peterson
98. Miss Prochazka
99. George A. Richter
100. R. S. Weston
101. Mrs. Sherley P. Newton
102. J. S. Dean
103. James Morrison
104. Floyd F. White
105. Mrs. C. B. Morey
106. C. M. E. Schroeder
107. Robert W. Savidge
108. Mrs. W. L. Spalding
109. W. A. Hicks
110. Price Green
112. Sherley P. Newton
113. J. W. Rawlins
114. W. L. Spalding
115. H. E. Batsford
116. H. Rollins
117. W. L. Spalding
118. A. B. Conner
119. C. B. Morey
120. Henry Hess
121. Carl Sundstrom

made to the plant, which will make it one of the largest and most modern of its kind on this continent.

Returning to the Hotel Quinte, at Belleville, in the evening, decidedly the most pretentious affair of the whole week's tour occurred when the American guests were banquetted by the city of Belleville and the county of Hastings. Already almost overburdened with kindness from the Belleville people, the giving of such a splendid banquet in their honor cemented forever the ties of friendship between Belleville and the Institute. Captain Allen was toastmaster, and speeches were made by Colonel Ponton, Nelson Parliament, M.L.A.; Wm. Nugent, past County Warden; Mr. Elliott, Major R. D. Ponton, the young returned war veteran acting mayor of the city; Dr. Charles Baskerville, Dr. J. C. Olsen, and Mr. David Wesson. During the evening, Dr. S. P. Sadtler, the first president of the Institute, announced that the medal of the Institute would be awarded to Henry K. Moore for his able accomplishments in chemical engineering and because of the added fact that he had devoted unselfishly a considerable part of his time to the writing of papers of great benefit to his fellow engineers.

At 11.30 p.m. the "special" pulled out of Belleville, for Shawinigan Falls, Quebec, arriving there at noon next day.

Friday, July 2.

Shawinigan Falls! We do not here have to enter into a description of the wonderful water power development and of the world famous electro-chemical works located at this great power centre. These have been fully described in this Journal.* To most of the visitors they were new. They had heard of Shawinigan and read about it, but now they had the opportunity of seeing the great turbines, the immense generators, the roaring carbide furnaces, and the intricate workings of the acetic acid plant, where acetic acid from acetylene is made. The huge plant of the Belgo Pulp and Paper Co. at Shawinigan was also visited and, under the guiding hand of Mr. T. F. McHenry, Plant Superintendent, a most enjoyable hour was spent here. The Belgo turns out two hundred tons of paper per day, one hundred and eighty tons of ground wood pulp per day, and ninety tons per day of sulphite pulp. Refreshments were served the guests on concluding the inspection of the mill. In the evening, at the Cascade Inn, the party were the guests of the Shawinigan Water and Power Co., where a buffet supper was served, followed by dancing, which only broke up in time for the departure of the train at midnight.

Saturday, July 3.

Saturday morning, the guests awoke to find themselves one hundred miles north-west of the St. Lawrence River at La Tuque, the home of the Brown Company's large pulp and turpentine plant. This is one of the largest sulphate pulp mills in America, and the members were here shown the logs being brought up out of the St. Maurice River on a

*"Canadian Chemical Journal," Vol. III, No. 8, August, 1919.

huge carrier, and cut into two-foot lengths. (90,000 cords of pulp wood are used per year.) They are then put through the barking drums and chippers, and then into the digesters, using the Morterude System of heating liquor. The spray process for burning the concentrated black liquors, recovering their caustic soda content was one of the most interesting of all the processes in the big plant. The Cottrell Precipitator, 100,000 volts, about 400-12" iron pipes, 90% working efficiency when in good repair, saving about 120 lbs. of $Na_2 So_4$ per ton of pulp was inspected with interest. The turpentine is made from the steam coming off from the digesters. The digesters are relieved for half an hour, after they get up to cooking pressure, their steam condensed, and turpentine drawn off from the top and refined.

Saturday afternoon at La Tuque will not soon be forgotten by the Institute members. At noon the party left the mill for Sorting Gap, on the St. Maurice River, about two miles distant, where the logs coming down the St. Maurice are collected, graded and sorted. The ladies in the party were conveyed to the Gap in a large lumber wagon, accomodated with seats, while the male members enjoyed the experience of a tramp through a Northern Quebec bush. Arriving at the Gap the company under the direction of Mr. Simmons Brown tendered their guests a real genuine Lumberman's Dinner, served in the camp men's dining room. How good that pea soup (A La Canadienne) and the pork and beans (cuite dans la terre) tasted after the morning's excursions! Boiled potatoes, carrots, onions, beets, turnips, apple, prune and raisin pie, gingerbread, doughnuts, cake, tea, coffee, ginger ale and beer—a memorable feast to be sure. Following dinner the French-Canadian lumbermen of the camp entertained their guests with songs of the Canadian Lumberjack. A log rolling contest was then staged in the river by two of the expert log drivers, and though further entertainment was in store, the ways of Nature, with which the lumberjack so often has to contend, ruled otherwise. Black clouds, thunder and lightning appeared over the hills to the north and in short time broke with considerable fury over the Gap, causing a hurried departure for the train, most of the party receiving a good sousing, which only added to the merriment. La Tuque was soon left behind, and the train commenced its last lap of the journey by rail, from La Tuque down to St. Alphonse on the Saguenay River, which was reached at 6 a.m. Sunday morning.

Sunday, July 4th.

Leaving the National Special at St. Alphonse the party boarded the steamer and had the privilege of a sail down the wonderful Saguenay River to the St. Lawrence, then up the St. Lawrence (the greatest of all rivers) to Quebec City. The boat journey occupied all day Sunday, making Quebec at 9.30 p.m. Despite rain that lasted until 3 o'clock in the afternoon, the boat trip was thoroughly enjoyed. The Institute members proved themselves loyal Americans, for, not forgetting that the day was their own "July 4th" they gathered around the piano in the steamer salon and sang "The Star Spangled Banner" and "God Save the King." As President Wesson remarked in his address at Ottawa, every real man admires the man who is loyal and proud of his native land and who also respects the loyalty of others to their country.

The Chateau Frontenac was the home of the Institute Sunday night, and Monday morning the visitors looked out of their hotel room windows on one of the oldest cities on the continent, a city rich in historical associations and scenic beauties.

Monday, July 5.

Soon after breakfast on Monday, an excursion was made to Ste. Anne de Beaupre, where the famous shrine in the church there was visited. Other points of interest throughout the city were visited and the party practically broke up Monday evening, many returning by train, while others remained over to take the boat trip to Montreal.

It was a great week for Chemistry in Canada, and one which will do much to direct interest in the further development of our resources and cement the bonds of good fellowship between Chemical Engineers of the United States and their Canadian brethren.

The following is a list of the members of the Institute who attended the Canadian meeting and tour:—

Professor J. W. Richards, Lehigh University, South Bethlehem, Pa.; Dr. Hugh K. Moore, Chief Chemist, Brown Company and Brown Corporation of Berlin, N.H. and La Tuque, Que.; Dr. A. M. Comey, Director Eastern Laboratory, E. I. du Pont de Nemours Powder Co.; Henry Howard, in charge of Development Work, Grassilli Chemical Co., Cleveland, Ohio; Professor Charles Baskerville, Professor of Chemistry and Director of the Laboratory, College of City of New York; H. S. Miner, Chief Chemist, Welsbach Light Co., Camden, N.J.; Dr. Ralph H. McKee, Associate, Dept. of Chem. Engnr., Columbia University, and Consulting Engineer for Tennessee Copper Co. and U. S. Industrial Chemical Co.; Dr. J. Takamine, Consulting Chemist for Parke-Davis & Co., Detroit, Mich.; Dr. Samuel P. Sadtler, Consulting Chemist, New York; John V. Dorr, President The Dorr Company Engineers; Dr. William D. Richardson, Chief Chemist, Swift & Co., Chicago; Dr. Arthur C. Langmuir, Superintendent Factory, Marx & Rawolle; Dr. L. J. Matos, Technical Chemist, Cassela Color Co., New York, N.Y.; Albert H. Hooker, Technical Director, Hooker Electro-Chemical Co., Niagara Falls, N.Y.; Wallace Savage, Managing Editor, "Chemical and Metallurgical Engineering," New York; Earl Durfee, Technical Director, Continental Sugar Co., Toledo, Ohio; Ralph S. Sherwin, Chemical Engineer, Aluminum Ore Co., East St. Louis, Ill.; Professor Albert W. Smith, Professor of Chemistry, and Director of the Laboratory, Case School of Applied Science, Cleveland, Ohio; Walter L. Badger, Professor of Chemical Engineering, University of Michigan, Ann Arbor, Mich.; Lieut.-Col. Edward Bartow, University of Illinois; Niels C. Ortvet, Technical Manager, Hiram Walker & Sons, Walkerville, Ont.; W. Hicks, Chief Chemist, International Nickel Co., Port Colborne Refinery; John T. Baker, President J. T. Baker Chemical Co., Phillipsburg, Pa.; Wm. C. Bainbridge, Chief Chemist, H. Kohnstamm & Co., Brooklyn, N.Y.; Wm. M. Barr, Consulting Chemist, Union Pacific R. R. Co., Omaha, Nebraska; J. W. Rawlins, Metallurgist, International Nickel Co., Copper Cliff, Ont.; Harry O. Chute, Chemical Engineer, Chemists' Club, New York; John G. Dean, Chemical Engineer in charge of Installation of Potash Recovery Plant, Canada Cement Co., Port Colborne, Ont.; Arthur D. Chambers, Chemical Engineer, Development Department, E. I. du Pont de Nemours & Co., Wilmington, Del. (a graduate Toronto University, 1892); Arthur B. Conner, Chief Chemist, Detroit Chemical Works, Detroit, Mich.; A. E. Gibbs, Pennsylvania Salt Co., Philadelphia, Penn.; Charles Hollander, Chemist, Rohm & Haas, Chicago, Ill.; Sigmund Wang, Chief Chemist, Riordan Pulp and Paper

Co., Hawkesbury, Ont.; Geo. P. Hahlweg, Chief Chemist, Arabol Mfg. Co., New York, N.Y.; S. F. Grove, Chemist, Henry Bower Chemical Co., Philadelphia, Pa.; Thos. Griswold, Engineer, Dow Chemical Co.; P. C. McIlhiney, Consulting Chemist, New York, N.Y.; L. D. Simpkins, Engineer, Research Laboratories, National Lead Co., Brooklyn, N.Y.; William G. MacNaughton, General Manager, Inland Empire Paper Co., Millwood, Wash.; Ralph E. Myers, Chemist, East Orange, N.J.; Carl Sundstrum, Chemical Engineer, Solvay Process Co., Syracuse, N.Y.; Freeman Gibson, Chemical Engineer, General Supt., Southern Cotton Oil Co., Savannah, Ga.; W. W. Rhodes, Chemist, Development Dept. E. I. du Pont de Nemours & Co., Wilmington, Del.; Arthur C. White, Chemist, Dow Chemical Co., Midland, Mich.; Robt. S. Weston, Consulting Engineer, Boston, Mass.; Arthur B. Conner, Chief Chemist and Chemical Engineer, Detroit Chemical Works, Detroit, Mich.; Geo. Davidson, Chemist and Engineer of Tests, Chicago and North-Western Railway Co., Chicago, Ill.; Edward F. Buchanan, Superintendent Acid Dept., Sherwin-Williams Co., Chicago, Ill.; Chas. T. Bragg, Works Manager, Michigan Smelting & Refining Co., Detroit, Mich.; William C. Carnell, Chemist, Rohm & Haas, Inc., Bristol, Pa.; A. C. Houghton, Assistant Chief Chemist, Semet-Solvay Process, Syracuse, N.Y.; H. E. Batsford, Electro-Chemical Engineer, Semet-Solvay Process, Syracuse, N.Y.; Herbert Meyers, Mellon Institute, Pittsburgh, Pa.; Robert W. Savidge, Assistant Chemist, Union Pacific R. R. Co., Omaha, Nebraska; Herbert Sidebottom, Technical Manager, Chemical Dept., The Barrett Co.

Progress in Dendro-Chemistry

Showing the Advances That Have Been Made in the Utilization of the Products of the Forest in Canada and the United States

By H. O. CHUTE*

It would seem appropriate that on this visit of the Institute to Canada something be said as to the chemical products of wood, as the forests of Canada are still one of her greatest assets and owing to the fact that their development on a large scale was later than that of the United States she has been enabled to profit by the mistakes of her southern neighbor and has done so in several ways leading to a conversation of forest resources and a better development of them, particularly with regard to the chemical products.

The World War showed America behind Europe and particularly Germany in many branches of chemistry, but not in dendro-chemistry, and England early turned here for a supply of acetone for cordite as America was the sole source of supply available and furnished nearly all used during the war and all during the early stages.

All chemical industries of the forest are by-product industries, or should be such, for nearly all woods are more valuable for timber and lumber than for their chemical products. The chemicals are therefore made from such pieces as, from their shape and volume are not useful for lumber.

In those industries where the chemicals are obtained before cutting the tree, the chemicals, for example turpentine, should be obtained in such manner as to preserve the timber value of the forest. An example of this is the Herty cup system of turpenting which conserves the timber as compared with older process of "boxing"[1]. Forest chemical products are divided broadly into educts and products; the former existing ready formed in the wood and the latter being the product of chemical treatment. Many educts are really pathological formations.

Another broad distinction divides them into products which are separated from the wood as a sap, gum, resin or latex which exudes from a wound and those which must be removed from the wood by cutting it and treating it chemically. Some products are removed both ways, for example turpentine and wood turpentine. The latter name refers to the product removed from the wood after cutting it.

Chemical products may be produced from the wood itself or from the bark, leaves, knots or roots.

Another broad distinction of products are those easily volatile or volatile with steam and those which are not. An example of the first is camphor which is always extracted by distilling with steam.

The wood structure itself is of ligno-cellulose. The cellulose is a carbohydrate; what the lignin is is not certain as the chemists are still fighting on the question. In nearly all woods can be found some resins, terpenes and tannic acid but the quantity and proportion varies widely.

Cellulose.

By far the greatest chemical product of wood in quantity and value is cellulose and it is the chief raw material of paper at present.

During the great war the Central empires were compelled to use wood cellulose for powder making and for twines and for clothing. We did not use any wood cellulose for powder on account of the large supply of cotton but experiments were proceeding along the line with promise of success.

In Germany it was even proposed to use wood cellulose for cattle food[2]. They found that if the lignin was taken from the wood substance by using the ordinary pulping methods, the cellulose was digestible if mixed with some other feed. It is probable that this was anticipated by the Yankee who painted excelsior green for horse feed.

Those of us who are old enough can remember the cotton famine in the north during the United States Civil War and that grocery twine made of paper was used commonly up till the eighties.

Wood Pulp for Paper.

From the invention of papyrus till two generations ago paper was made from fibres of reeds and plants, and wood cellulose was never utilized by man for paper though the wasps and hornets were making a pretty good quality of paper from wood long before his advent. The manufacture of wood pulp originated in the United States and

*Paper read by H. O. Chute at Montreal meeting, American Institute of Chemical Engineers, June 29, 1920.

[1]See U.S. Dept. of Agr. Forestry Bull. No. 90, and Chem. Ab., 1912, p. 1847.

[2]Ch. Ab., 1919, pp. 1504 and 2067.

Americans invented most of the necessary processes.

There are four principal processes of making paper pulp from wood namely the ground wood process, the soda method and its near relative the so-called sulphate process, and lastly but of most importance is the sulphite process.

Ground Wood Pulp.

This method of making pulp consists in holding on a grindstone a "bolt" or stick of wood at an angle and while keeping a strong stream of water on the stone the wood is ground down to fibres. It is preferable to steam the wood first and the U. S. Forest Products Laboratory recommends boiling the wood[3]. The Canadian Forest Product Laboratories have shown that ground wood absorbs 52% of the spruce produced[4].

The invention of ground wood has been ascribed to Keller and Voelter who exhibited the machine and product at the Paris Exhibition of 1867, but the Canadians have claimed that it was invented there, by Chas. Finerty Sackville in N. S.[5], though the previously cited publication attributes to Alexander Bunton the first installation at Valleyfield, Que. It is also said that the process was installed at Chesterfield, Mass. in '67. Modern magazine grinders have superceded the cruder machines but the grindstone still does the actual work of grinding the pulp. Much water for power is needed and also for cooling the stones

White spruce is the preferred wood though nearly 50% balsam may be mixed with it and even a little birch has been used. But this grinding produces only a separated wood fibre and any color or impurity must remain in the product, therefore a soft white long fibred wood free from gum and resin is best.

There is no chemistry in the process itself but there is the bark by-product which we will show later is of importance for tannin extract. The U. S. Forest Products Laboratory investigations show that the bark contains from 8.34% tans up and they estimate that 55% of our tannins could be recovered from paper wood barks[6].

Ground wood forms from 70% to 90% of our newsprint and such building fibre sheets as "Beaverboard" are largely composed of it. For higher grade papers it is not favored. It is seldom bleached.

Soda Pulp.

This is made by chipping wood and boiling it under pressure in a steel digester with caustic soda. It makes a fine soft pulp, easily bleached, suitable for use in filling book and bond papers. It is also largely used in good blotters. One of our members[7], has given a good description of the process as it was then worked in Canada. It was shown that the Windsor Mills, P. Q. began the manufacture shortly after the mills at Manayunk, Pa., and Royersford, Pa., where the first American manufacture of soda pulp began. In 1854 Chas. Watt and Hugh Burgess received a United States patent for pulping shavings by treatment with caustic soda and this was the birth of this industry. The United States Supreme Court held the patents invalid but this was owing to their having a poor patent attorney. The Jordan engine was also invented there.

It is probable that the introduction of the multiple effect evaporator invented by Homer T. Yaryan of Toledo[8] into the art contributed much to its profitable outcome. The N. Y. and Pa. Paper Co. of which Col. A. G. Paine was president did the necessary work to sucessfully demonstrate the savings of the operation of the apparatus.

While a vaccum pan was introduced in America at Plaquamine plantation in 1831 and the multiple effect apparatus is the invention of Norbert Rilleux, a creole Frenchman born in Louisiana who introduced it in 1843 at Bayou La Fourche and at Myrtle Grove plantation and had fifteen installations in Louisiana in 1851; yet, until the Yaryan apparatus was introduced into the soda pulp business all the evaporation was done rather crudely. The writer dismantled a soda pulp factory at Fenelon Falls, Ont., in 1898; to substitute a wood distillation plant. It had no improved evaporation system but had it had such a system it would have been profitable. Here was a failure due to neglect to progress and put in improved apparatus.

The latest improvements in this industry have been described lately in Canada[9]. Aspen is the favorite wood though the coniferous woods such as jack pine are used. They are harder to decompose and do not bleach as well. The hard woods such as beech and maple and birch are worked successfully. On account of their weight they give a large tonnage per cord.

The chemical engineering problems connected with the process are largely due to the problem of recovering the soda used and putting it into condition for re-use.

An idea of the amount of evaporation necessary may be had by noting that more than one-half the weight of the wood is dissolved as organic combinations with soda. The spent liquor of 10° Bé. as sampled contained 14.4% solids. When concentrated in the Yaryan evaporator to 40° Bé. it contained 37% water, 34% organic matter, 26.7% soda and 2.3% other mineral matter.

The soda was three-fourths combined while the other fourth was carbonate.

For every ton of pulp made 12 tons of water must be evaporated.

The first evaporation is in multiple effect, but after it gets to 40° Bé. it is too stiff to work further and it is fed into a rotary furnace like a cement kiln, they were made about 15 feet long but now they are 30 feet long and 9 feet diameter. These will produce 50 tons of black ash. A fire is kept up in front and seemingly the flame is always a reducing flame but much heat is generated from the combustion of the ash and is utilized in waste heat boilers.

Just why the soda cannot be smelted as is done in the sulphate process the writer does not know. The black ash is leached usually by diffusion processes and re-causticized. The counter current decantation system described in Vol. 6, p. 86 has been applied in the causticizing and modern filters have been used to de-water the lime sludge. The writer saw this sludge dried in rotating drums to produce a substitute for English whiting, but it is not white like English chalk.

Reclaiming the lime in rotary kilns, such as those just described in paper by Richard R. Meade, has been used in one or two places, but there is a fear of it. The author saw this operation very successfully carried on at Salinas, Cal., with calcium carbonate residues from beet sugar manufacture, and believes it will avoid a nuisance as well as be profitable in the pulp industry. There are losses all along the line and a recovery of 85% is good work.

By the counter current system of decantation the filter press receives the nearly extracted ash. This gives a

[3]Ch. Ab., 1918, p. 1122 and U.S. Dept. Agr. Bull. 343.
[4]"Pulp and Paper Mag.," Can., 1919, p. 3.
[5]Ch. Ab., 1915, p. 1930.
[6]Ch. Ab., 1919, p. 2144.
[7]J. A. DeCew, J. Soc. Chem. Ind., 1907, p. 561.
[8]See Trans. Am. Inst. Ch. Eng., Vol. X, p. 206.
[9]E. Sutermeister, "Pulp and Paper Mag." Can., 1919, pp. 215 et Seq.

concentrated solution of carbonate and a thorough extraction. Both multiple effect evaporation and diffusion are highly developed in the sugar art.

The residual carbon has for many years been utilized at one works on a small scale for making a commercial carbon and at least one manufacturer has developed a decolorizing carbon from it which has special value for limited fields.

Quite a little experimental work had been done several years ago and a number of patents taken out on the production of acetate of soda from the black concentrated liquor and attempts were made to produce methyl alcohol and acetone from it. During the war two very extensive plants were put in to make acetone by destructively distilling it in presence of excess lime. Reports are quite favorable but commercial work was not begun when the armistice was signed and both plants are now reported idle.

After mixing the 40° liquor with a large excess of lime the resulting solid mass was fed into a revolving cylinder 160 feet long and 6 feet diameter at the exit end. The entrance end was much enlarged so that it was about 18 feet diameter. It was of ¾-inch steel closed at each end and set in a fireplace. Another acetone furnace was 8 feet diameter and of the same general construction. Arrangements were made for the feeding in at one end of the mixed waste and lime and at the other end were arrangements for discharging the waste black ash and lime and also taking off the acetone vapors developed. Numerous fireplaces under the revolving retort allowed heat treatment and regulation. It was said that this process made more acetone from a cord of wood than could be obtained by wood distillation.

Some years ago the writer, with others, developed a process for increasing the amount of acetate in these wastes by carefully oxidizing the heavy liquor.

United States patent No. 1002034 describes the process which would, of course, increase the amount of acetone made in any subsequent process of destructive distillation.

Alcohol, acetone, terpines and other volatile substances are reported to occur in the vapors discharging during the cook. It has been feared that their recovery would be too expensive owing to the immense amount of steam which would have to be discharged. This is probably overestimated, as by some little regulation all the volatiles could be removed with the loss of little steam. The condensation of the steam under pressure would heat up a large quantity of water which is useful. The further recovery by fractional distillation would be easy if the methods used in other industries are adopted. Later descriptions will be given of processes for working resinous woods to recover the resins and also to make pulp.

When the evaporation and burning to ash is so economically done that the heat is all furnished by the combustion of the organic matter or when acetone, and decolorizing carbon are by-products together with reclaimed lime and the volatile products such as alcohol and terpines are saved the chemical engineer will have made this an almost ideal process.

Perhaps the dust collecting systems described in "The Transitions," Vol. 8, pp. 35 and 36, would give a further economy in chemicals. We shall see this at La Tuque working on soda recovery.

The Sulphate Process of Pulp Manufacture.

In 1871 John Eaton, of Brooklyn, N.Y., received a patent claiming the use of sodium sulphide in treating wood for pulp and got it by reducing the sulphate.

John Priestly, of Philadelphia, claimed at this time that he had worked with the sulphide and proved its superiority to caustic. The Eatons put up a plant in Brooklyn to work the process. The sulphate process was not a success till much later and the particular success of the process is in making "Kraft" pulp. This is said to be due to the stupidity of a Swedish workman who dumped a digester too soon as was then thought. The Superintendent of the factory, though, ran it through a kollergang to reduce it and was much surprised to find it a strong and good pulp[10].

The sulphate process, so called, is a modification of the soda process in which the losses of soda are made up by adding sulphate of soda to the causticising tubs. On the next pass it is reduced to sulphide in the furnace so that the liquor is a mixture of sulphide, caustic and other thio compounds.

As we will see this process at La Tuque and we have had the operations of the plant described in Vol. 10, p. 177 of our transactions it is unnecessary for the writer to describe it further and prudence would dictate caution when there is the probability that any inaccurate statements may be so soon discovered.

However, should any inaccuracies of the writer appear, it is only necessary to call attention to the extraordinary character of the La Tuque plant and its extraordinary technical management, compared to the standard practice[11]. Spruce wood is undeniably the best wood for the sulphate process, but as various classes of pine are so well worked by this process it is very largely used. We were told that La Tuque uses the pine of the region. In several Pennsylvania plants the ordinary field pine of northern Virginia is hauled the long distance and worked seemingly better than any other available wood.

Several plants in the southern states are making a success of the process operating on the long leaf pine offal from the saw mills. When producing kraft there is the advantage that it makes a marketable paper direct so that any mill should find a local market in the wrapping paper field.

The problem of recovering the soda is the same in both processes and only differs usually in that the black ash of the sulphate process for the revolving furnace is dropped into a smelting furnace with air blast, the gases passing through the revolving furnace and supplying it with heat. No fuel is necessary to produce a fused cake of carbonate and sulphide of soda from the concentrated liquor except that supplied by the combustion of its own organic matter. A large surplus is utilized in disc evaporators and waste heat boilers. In fact one of the firms building this machinery claims to do all the evaporating and recovery by the heat developed by this oxidation or burning of the organic matter in the spent liquor.

Why the soda process ash is not fused in a smelter thus the author knows not.

Owing to the formation of mercaptans in large quantities this process is well adapted for such places as La Tuque and on the Southern pine barrens.

Both these processes are most economically carried on in connection with a saw mill using up those parts of the timber supply not suitable for lumber and utilizing the sawmill refuse for fuel. Owing to all solutions being

[10] Ch. Ab., 1908, p. 317.
[11] "Paper," Vol. 20, 1917, Carl Moe.

alkaline iron and steel vessels can be used without undue wear taking place.

It would even be possible to manufacture the chlorine and soda electrolytically if enough sawdust and other fuel were available. Later we propose to show that the soda pulp business led to the invention in America of the electrochemical manufacture of chlorine and soda.

The Manufacture of Paper Pulp from Wood by the Sulphite Process.

The most important process of making paper pulp in America is the sulphite process. In 1866 B. C. Tilghman received United States patents claiming pulping the wood by the use of bi-sulphites. While he made paper, his process was not perfect and the mechanical means of working were not yet invented. In Vol. 1, p. 130, of our transactions are given specifications for sulphite pulp.

While Europeans worked on the process and got important results, it is probable that the American invention of using a cement lining for the digester made commercial success possible.

On our visit to Berlin, N. H., a few years ago, we were shown all the essential details of the process and saw most of the apparatus at work.

At another plant, recently, the practice was about as follows: Canadian barked spruce wood was chipped as usual and 18 cords put into a digester with 22,000 gallons of liquid containing 1.3% of bi-sulphites of lime and magnesia in the proportions of the alkaline earths found in dolomite stone. About 3% of free SO_2 was absorbed in this solution. After the usual cook during which the steam and SO_2 evolved passed to lead pipes and were cooled and the SO_2 reabsorbed; the residual liquor from the pulp contained about 12% of total solids. The writer does not know just what these are, but knows some things they are not which they are said to be.

Firstly, in a proper cook there is no appreciable amount of either free or combined SO_2 in the liquor. There are substances which will reduce a small quantity of iodine and on acidifying they will distil over and reduce iodine, but the oxidized product will not precipitate with $BaCl_2$.

Secondly, the free acid is about equal to 1/10 normal, of which two-thirds is acetic acid. In a liquor with 10% total solids were found 0.857% ash, of which 0.286% was CaO and 0.218% was MgO. The total SO_3, as determined by $BaCl_2$, was 1.010%, but the total sulphur found on oxidizing and precipitating with $BaCl_2$ was 0.6825%. The tans were 4.13%. The reducing sugars were 2.5%. These were not all fermentable; the writer has observed an almost constant ratio of two-thirds being the proportion of fermentable to reducing sugars.

Utilization of Sulphite Waste.

The waste liquor has been the subject of much work and the Institute has learned of the manufacture of alcohol from it as recorded in our transactions in Vol. 11, p. 55.

It has been used in America for core compounds, road binder[12], making yeast[13], alcohol and tans.

It would seem that if the proposed process of fermenting and concentrating to small volume were put in operation that perhaps yeast containing the nitrogen, alcohol, and tanning material could all be recovered and a purer tanning material thus produced. Producing all the above would be little more expensive than producing one.

Other By-products of the Sulphite Process. All the spruce wood is barked and it is known that the bark contains some tannic acid. At least one company is putting on the United States market spruce bark tan extract under the name of "larch" extract. There are various tanning materials made from the sulphite waste sold under the names of "spruce," "muskegon," etc.

To produce a tan the lime must be removed from the waste liquor and this is done by sulphuric acid or sulphates or by using alum, etc. It is a singular fact that on concentrating a neutralized liquor calcium sulphate crystallizes out, removing the lime thus almost completely when strongly concentrated.

As a road binder sulphite waste is excellent on some soils containing certain clays. Without these clays it is perfectly useless as a binder. There is some protective colloid action here which is unknown, but it would be exceedingly useful if it were well enough known to enable one to use the liquor with assurance of success for road binding.

Cymene. It has been known for a long time that cymene was the terpine given off from spruce under the sulphite treatment, but lately attempts have been made to utilize this for making toluol[14]. Thymol,[14], and carvacrol[14], are said to have been made from it. During the war the sulphite manufacturers were asked to save the cymene, but none or little was saved. It would appear easy to allow the condensate of water and cymene from the blow off to settle in a quiet tank while the SO_2 passed on for recovery. When the cymene came to the top the water charged with SO_2 could be removed from the bottom. This only requires a trap in the lead condenser line and a settling closed tank.

The manufacture of thymol from cymene has been patented[15] and somewhat developed in France. At present its price is very high ($14.20 per pound) and it is almost unattainable. It is considered a specific for the sleeping sickness.

As sleeping sickness produces an inability or lack of desire for work it would appear that the whole world now needs a thymol treatment.

Electro-chemical Development.

Previous mention has been made of the fact that the paper pulp industry of the United States furnished the market for the product, the stimulus, and perhaps most of the money needed for perfecting the electrolytic decomposition of salt which has freed America from the European monopoly of chlorine and the near monopoly of caustic soda manufacture. In proof of this is the following quotation from an article in the Journal of the American Chemical Society, of November, 1898, by Prof. Chas. Parsons, "E. A. LeSueur enjoys the distinction of having invented the first electrolytic process for the decomposition of NaCl which was commercial. Since February, 1893, there has been a manufacture of chlorine and bleach at the Rumford Falls paper plant.

He began experiments in 1887, and in 1890 in the paper mills at Bellows Falls, chlorine and bleach were made commercially.

We thus see that two paper mills were associated with this electrolytic process in its infancy and we have a number of members who were also pupils of this inventor who can perhaps enlighten us on its early history.

To the invention of graphitizing carbon by one of our members is due the great modern success of this industry.

[12]C. Ellis, Pat. No. 1042538.
[13]U.S. Pat. No. 1044615.

[14]J. Ind. and Eng. Chem., 1918, p. 259.
[15]J. Ind. and Eng. Chem., 1918, p. 259.

as every type of cell relies on graphitized carbon for the anodes.

Other Products of Cellulose.

Cellulose esters as nitrates are the basis of all propellant powders used for military operations. As before said, the Allies did not utilize wood pulp, but the Central powers were forced to use them almost exclusively and a sporting powder made from wood pulp was on the market for years before the war.

It is believed that wood pulps have been successfully used in making the pyro-cellulose plastics used industrially. The artificial silk industry, using the xanthate or compound of cellulose formed by solution in caustic and carbon bisulphide, is expanding rapidly in the United States. One of our members has developed this material for making tubes and films and it has been used for sausage casings, which were exported to Europe and encased the genuine Frankfurter, though the Coney Island hot dog seldom wore these clothes[16].

Oxalates are made by decomposing wood by heat in the presence of a large excess of alkali. The U. S. Forest Products Laboratory[17] has shown that a yield of 74% oxalate could be made by heating with three parts of alkali to one part of wood and to 200° C. using southern pine. With oak the yield was 60%. Maple and elm yielded 14% acetic acid at the same time. By crystallizing out the excess sodium carbonate as decahydrate the oxalate was purified. A factory has operated in the United States for ten years, but oxalate is now quoted at 60 cents a pound.

As a by-product of a sawmill; oxalate of lime would be the best form in which to manufacture and ship this valuable substance.

Sugar and Gums as Wood Products.

North America is unique in having the only deciduous tree that produces sugar in commercial quantities. The *acer saccharum*, sugar maple or hard maple is well known as a producer of sweets and the Indians knew of its sweet sap and evaporated it down in earthen vessels to a dark sweet solid sugar. There is some question as to whether the Puritan Yankees or the French-Canadian first learned the art from the Indians. A description of the Canadian industry has been recently published[18]. The industry is seasonal and as the production is so scattered no large factories can be installed at a profit, yet some modern methods are used; even pipe lines convey the juice to the evaporator plant by gravity in favorable locations.

The yearly production is about 40,000 tons.

Palm sugar and toddy, the alcoholic drink made from it, are important in tropical Asia and contiguous coasts; 100,000 tons of palm sugar were refined at Asiatic ports last year and 10,000 tons were refined in Europe.

Sugar and Alcohol made from Wood Cellulose or Substance.

We were shown in Vol. 8, p. 262, of the transactions by Pres. Little that, though the Braconnot process of hydrolyzing wood to sugars by acid was over one hundred years old and the eminent chemist Classen had induced large scale attempts here to work his process, yet only when American inventors modified the process was it a commercial success. The yields of the process are not positively stated by anyone, but the writer was told by a practical workman that at a southern plant the yield of alcohol was about 11.25 gallons of alcohol per cord. One of our Canadian members has modified the process by using HCl[19].

Gums. Of the true gums—that is substances soluble in water and insoluble in alcohol, for example, gum arabic, the North American continent has no trees that produce any commercial article.

Gums, Resins and Balsams.

These terms are used loosely in many cases to denote products which are not strictly what they are called. For example, Canada balsam is really an oleo resin. It contains a terpine and a resin in solution; the same applies to "gum" turpentine, which is a terpine saturated with a resin.

Canada balsam is known to all who use the microscope and for lens makers and others who cement glass; it is quite important as its index of refraction is the same as glass. Its other uses are quite restricted.

Oregon balsam is a nearly related product of limited use. While Canada balsam is quoted at $16 per pound the Oregon is quoted at $1.80.

Camphor. While synthetic camphor is being manufactured to a considerable extent in the United States, yet the price of camphor is now $2.40, and a monopoly of natural camphor is enjoyed by the Japanese. There are, however, a number of groves of camphor trees in Florida covering thousands of acres, and perhaps in time they may produce a considerable product. The tree flourishes there.

Eucalyptol. In southern California, the Eucalyptus Globulus or Australian blue gum flourishes, as can be seen by any outside movie scene. In Australia this is said to produce the terpene Eucalyptol, but the writer tested pure oil from the "globules" grown in California and it does not stand the U. S. P. test of solubility in alcohol prescribed.

Eucalyptol is now quoted at 80 cents per pound for American and 90 cents for Australian.

Oil of Sweet Birch. This is an oil which is largely methyl salicylate, but it has a very pleasant odor and is quoted at $5.75 per pound. It is obtained by steam distillation of the birch bark. Both this and the true oil of wintergreen are subject to great adulteration, particularly with the synthetic product, but while wintergreen oil is much higher even than birch oil, yet experts can apparently tell them apart.

Styrax or Storax. Our supplies of liquid storax were obtained from the Levan with no interest shown on our part to obtain it from our own forests till the war shut off the supply. The sweet gum "Liquidambar Styraciflua," found so plentifully in the south produces a similar product, as can be seen by Thorpe, as samples were exhibited in the Paris exhibition of 1878. The yield is two pounds per tree and it contains 35% cinnamic acid[20].

The foreign is quoted at $4.00 per pound and the American brings only $1.85.

Turpentine.

The Southern long leaf pine, the Pinus palustris or australis, which grows from Virginia to Texas along the seaboard, produces the chief amount of "naval stores" used in the world. Turpentine, rosin and tar are called naval stores on account of their great use in wooden sailing vessels. The tar was used for calking and preserving ropes. The turpentine was used for paints and the rosin had many like uses. For the calendar year there were exported $10,000,000 worth of turpentine and $20,000,000 worth of rosin.

[16]Ch. Ab., Vol. 9, p. 3358. Cohoe, U.S. Pat. 1158400.
[17]Ch. Ab., 1919, p. 1923, and J. Ind. and Eng. Chem., 1919. p. 651.
[18]J. B. Spencer, Canadian Forestry Journal.

[19]C. A., Vol. 6, pp. 1553 and 3329.
[20]J. Ind. and Eng. Chem., 1917, p. 770.

This is not, however, the time and place to discuss the gum turpentine industry, as the last preceding meeting of the Institute was held in the heart of the turpentine belt. It was observed there that the pine of the South is rapidly disappearing under the woodsman's axe. The present quoted price of turpentine is $2 per gallon, while the pre-war average was 60 cents. Rosin was formerly the cheapest organic acid and was largely used as the soda composed in soaps. Its present price puts it at about where the fatty acids were in pre-war days. Present quotations are about 10 cents per pound.

During the United States Civil War the scarcity of naval stores led to the development in Canada of attempts to obtain "wood" turpentine from the pine called red pine in Canada and "Norway" pine in the United States. It is not the true "Norway" pine of northern Europe, from which the "Russian" turpentine and "Stockholm" tar are made by destructive distillation, but the stumps are quite rich in resinous matter. Some few attempts are made occasionally in Canada and the United States to utilize this "Norway" pine for producing wood turpentine, but no great success has attended any of the enterprises as yet[21].

We shall see at La Tuque the recovery of "steam distilled" turpentine recovered from the digesters while boiling the pine chips for pulp[22]. In Vol. 1, p. 216[23], we were given a rather full description of the wood turpentine industry as it existed then in the South, and the writer, in a tour of examination of the industry last fall, saw few improvements over what was then described as the existing art. The author made a rather extensive tour of the eastern southern states in 1904 and examined into the status of the industry as it then existed. This embraced 55 plants running and abandoned.

At Wilmington, N.C., is the Spirittine Co., which traces its history back to the late seventies. It still exists and has gone into bankruptcy only a few times and at times has paid dividends from actual earnings. This can be said of only a few plants which can be counted on the fingers and perhaps using only one hand. This is a crude destructive distillation process putting "light wood" into round retorts and firing them till charcoal is produced and then cooling and emptying them. The oils are crudely separated by a few old turpentine stills and the product has a limited market, but the plant has paid from time to time. Many fantastic schemes for varying the process have been patented and tried and described[24]. No one has yet put in the well tried, successful processes and apparatus of the hard wood industry. Till they do; the industry will never be on a sound basis. In the writer's opinion destructive distillation as practiced on the hard wood using the same machinery and the knowledge gained in this art will make a success of "wood turpentine" manufacture.

The "steam distillation" process recovers only a small quantity of the volatile oils. This is because only those cells cut open and exposed have their oils removed with steam. The solvent extraction plants have suffered the fate of all Soxhlet extraction plants which work industrially. Namely, they either burn up or blow up. They also fail to recover all the solvent and leave some mixed with the turps. Any expert can, by shaking and observing the bubbles in a bottle of oil of turpentine instantly detect petroleum mixtures.

[21]Ch. Ab., 1911, p. 992.
[22]Ch. Ab., 1909, p. 1083.
[23]Trans. Am. Inst. Chem. Eng.
[24]See Harper, Utilization of Wood Waste by Distillation, Ch. Ab., 1909, p. 374.

An attractive process was patented by one of our members[25]. In this process the chipped wood is put in a digester and mildly digested with a dilute soda solution till most of the rosin is dissolved. The turps in the meantime distil off the digester and are condensed and saved.

When the rosin has dissolved, the solution of sodium resinate is discharged from the digester and a stronger soda solution is put in and the usual soda process carried out. Thus, the resin does not materially interfere with the paper making.

The sodium resinate is treated with enough caustic to make a 6% solution which "salts out" the resinate of soda. This product is used for soap or the resin otherwise recovered. The strong caustic is of course used for a subsequent charge of wood. Here is a complete utilization of the cellulose, terpines and resins of the wood. Incidentally it has been found that the southern pine stump fibre when freed of the resins is particularly long and may be used for tarred paper. Any burned wood would not affect its value greatly, as the color is of no importance owing to the final product being black. We will probably see at La Tuque the recovery of turps from the digesters. The production of turps by relieving the digester of gases was experimented on some time ago[26]. It is claimed that two-thirds of 1% of the wood may be recovered in alcohol[27].

We have had pointed out to us,[28] the possibilities of the coniferous woods being used in the manufacturing of chemical products.

During the war the Germans evidently made wood turps, as one of them reports[29] that they seized the Polish and other plants and used prisoners for operating the kilns and gathering the wood.

Tannins and Dyewood Extracts.

The discovery of the use of wood extracts for tanning and dyeing is prehistoric. Many of the most savage and primitive tribes have knowledge of their use.

In late years the United States has produced about 200,000,000 pounds tannin extract annually and has imported —mainly from South America as quebracho extract—about as much. Much bark, as hemlock and oak, is also used for the production of leather.

Some one has said that anyone who can make a pot of tea can make a wood extract. In an earlier day this was perhaps so, but modern methods have been introduced into this industry.

The most approved practice in the United States is to grind the woods or barks, etc., and extract in a diffusion battery under pressure. This necessitates the use of copper to give the strength and resistance to the acids which are present. Probably the most popular extractor or diffusion cell is about 5 feet diameter and 12 feet long, slightly enlarged towards the bottom so as to allow of quick discharge of the exhausted chips. The bottom is hinged and is the diameter of the cell and, on opening, the charge drops out to a conveyor which takes the chips to the boilers for fuel. These usually furnished all the steam necessary to the works. Each wood requires a different temperature and pressure and treatment to get the best extract. Some woods, such as quebracho are best extracted by adding some SO_2 to the liquor to dissolve the more refractory tans. Some extracts like logwood are oxidized, the oxidized logwood extract being called "hematine" and this is

[25]U.S. Pat. No. 1142992 to M. C. Whitaker, Jour. Ind. and Eng. Chem., 1914, April, pp. 289-298.
[26]Ch. Ab., 1913, p. 3835 and Ch. Ab., 1907, p. 2635.
[27]U.S. Pat. No. 1032982, Ch. Ab., 1913, p. 2855.
[28]A. G. Little, Trans. Am. Inst. Chem. Eng., Vol. 8, p. 258.
[29]Ch. Ab., 1919, p. 3034, and Ch. Ab., 1917, p. 1295.
[30]J. Ind. and Eng. Chem., Nov., 1915, p. 915.

used for leather dyeing and where oxidation after applying cannot be used. On the other hand, the unoxidized logwood is preferred where bichromate mordants are allowable.

Hemlock—*Abies Canadensis*. This was a most important tanning material and is still largely used, but unfortunately the eastern supply is diminishing rapidly. Much was used as bark, but extracts are now largely substituted. There was an extract works for hemlock in Nova Scotia for a long time and there may be more in other provinces. The Canadian hemlock bark averages from 8% to 10% tannic acid. Unfortunately this is not high as compared with the United States and particularly the western hemlock which has been shown to average 17% tannin[30]. The same authorities show that Penn. hemlock averages 13% and Quebec 10.1%.

Other American coniferous woods have been tried, but the amount of tannin is much smaller than in the hemlock. The utilization of spruce bark for tans has been mentioned. As this is a useless by-product it may be utilized even though the yield is small.

Oak Bark. Oak tanned leather is considered the best for harness and belting, but perhaps the union tan for sole leather gives the best shoe sole.

All the different woods and tannins differ in containing various other constituents. Some contain glucose which by fermenting, produces an acid liquor which is desirable at certain stages of the process and for certain leathers. Others contain much coloring matter and give colored leathers which are desirable or not according to their purpose. Those extracts which will not ferment, such as chestnut and quebracho, are used in connection with such fermentable extracts as hemlock, etc., or are used in the latter stages of tanning.

Chestnut Extract.—This is produced in the United States in enormous quantities from the true chestnut tree, which produces the American edibile chestnut.

A method of drying the extract to a solid by spraying is discussed in Trans. V, 10, p. 421.

The chestnut oak bark is a valuable but entirely separate tanning material.

What seems to be a purely American invention is the production of a tannin from the chipped wood and a soda pulp from the extracted residue, thus utilizing both the fibre and tannin in the wood.

The wood must be barked and chipped differently than usual.

What seems to be true of the hemlock seems also true of the chestnut.

Woods grown as far north as New York State seem worthless for tannin. In Pennsylvania they are used successfully, but the most prosperous extract works are in the southern Appalachians, for example, in North Carolina and Tennessee, the southern limit of its growth. Until a generation ago the chestnut tree was considered useless for wood and other purposes, but now that it is found useful the blight has struck it, and between the tannin factories and the blight it seems doomed to extinction. Whether the European chestnut is immune to the blight is an interesting question, and the dendrologists might with profit investigate this with a view of introducing the European tree. Chestnuts, as is well known, are a staple food in Italy.

Dye Woods and Extracts.

While the coal tar dye industry languished in America till the war stimulated it the manufacture of dyes from woods was an important industry in the United States in an early day and remained such till the present. Even before the war much logwood extract and much Italian sumac extract were exported to Europe and even Germany was a large customer. Many yellow, blue and black dyes bought from Germany as coal tar colors were composed in great part of American extracts.

Logwood. While this only flourishes in the tropics, yet it is a Mexican, Central American and West Indian Island product exclusively and was unknown till the discovery of America. The United States imports and extracts enormous quantities and the demand during the war was so great that the extract sold for a dollar a pound and the industry expanded greatly. Many of these war babies died soon after the armistice, but a larger industry remains for legitimate demand. For the finest broadcloths and like goods where a black with a "bloom" is necessary logwood is still indispensable. As mentioned before, logwood appears either as liquid or solid logwood extract or as "hematine" crystals. The latter are produced by oxidation of the logwood. A favorite method of oxidizing is by blowing air into the extract. Logwood is used for dyeing blues and blacks. Its tin salt is a brilliant purplish red, but is not fast and the same can be said of the aluminum dye or mordant. It requires a mordant, preferably bichromate of potash or a chrome alum to give the fastest dye. With iron it gives a fine black.

Inks are thus made. For leather dyeing a chrome tan acts as mordant to the dye. At the same time the extract is both dye and tan. This makes a particularly good combination for this purpose. Adding a trace of yellow produces a jet black. For weighting silk a tin salt followed by logwood increases the weight to almost any weight that the conscience will allow, although silk weighted moderately is superior in many ways to the pure silk.

In cotton dyeing manufacturers are urged to use logwood in large quantities to give a fast dye and also give weight. The goods are sold by weight and logwood costs less than cotton. In dyeing cotton it is first mordanted with a tan and fixed with tartar emetic or other metallic salt. Then an iron salt is used for the logwood dye, which gives a solid black and an increase in weight.

Quercitron or Black Oak Extract. While this is a tan, it is used mostly as a dye. It gives shades of yellow and orange on wool that are quite satisfactory and much used. It takes the place of old fustic and is much cheaper.

It is only found in the United States. A member with experience in this line has stated[31] that 72% of the quercitron extract called flavine was used by the Government during the war, as was 80% of the logwood.

Osage Orange. This is a native American tree found in greatest profusion in the West, particularly in Oklahoma and Texas, where the best dyewood is found. The tree is used for hedges in the East and as far north as Connecticut, but like all the other dye and tan woods, the best yield is from the southern grown woods. Texas and Oklahoma woods are preferred.

It furnishes about 14% of extractible matter and it contains a dye which gives some lemon shades better than quercitron or fustic, and gives very satisfactory yellows and oranges on wool. It was used in great quantities for khaki uniforms in conjunction with a little logwood. Like logwood it goes on to a chrome mordant best. It is possible that for leather work this will have a large field, as it contains tannin and with a titanium mordant gives a very fine yellow dye. The introduction of this dyewood during the war is due largely to the efforts of the Depart-

[31]Delaney, C.R., Ch. Ab., 1918, p. 2690, and J. ind. and Eng. Chem., 1918, p. 796.

ment of Agriculture, who worked on the problem and found its merits as a dyewood.

Previous reference has been made to the work of the Forest Products Laboratory, which shows that the barks of pulpwoods contain from 8.35 to 11.34% of tans and that if they were all utilized it should supply 55% of our requirements[32].

Spent tan bark is of importance in making old Dutch process white lead, and tanneries have erected and run with the primary object of getting a supply of exhausted bark.

A member [33] has pointed out the benefit that the introduction of the chemist has been to the tanning industry.

Wood Distillation.

The author was first interested in this industry in 1888 and for many years was solely engaged in erecting and superintending plants, having been in Canada for two years during 1898 and 1899 constructing and operating at Fenelon Falls and Deseronto, Ont., the two first retort plants which operated in Canada.

During that time a number of improvements have been introduced in the industry and having contributed some, it is felt that there is justification in bringing them to the attenton of the Institute as the Germans, as usual, have rushed in to claim them.

In Trans., Vol. 7, p. 203, is record of paper given at Philadelphia meeting which reviews the industry well as it existed at the time and little has been done of much importance since, notwithstanding the great war call for the products.

It is not believed that any material increase of capacity of plants or improvements of processes resulted from the fevered attempts to immediately increase the volume of product. The paper gives numerous illustrations which show the methods of handling wood and carbonizing it and a few illustrations of crude apparatus used in the older methods of working up and refining the products.

A capacity of 4,802 cords in the United States and of about 500 cords daily in Canada was given as the capacity. This would give about 1,500,000 cords as yearly capacity. This should produce about 15,000,000 gallons of alcohol, but under the stress of war and present demand the product has not reached this point.

As little has been said about improved methods of recovering and refining to chemicals it will be discussed here.

As shown in above references, the process of carbonizing now largely adopted consists in piling cordwood on an iron car holding two cords, which is run into an oven retort first developed at Straits, Pa., in 1895. The vapors produced by heating pass to vertical tube condensers and the pyroligneous acid resulting is settled to remove about 15 gallons of tar per cord and the acid liquor passes continuously into pot stills and all but the tar is distilled over. This acid liquor is neutralized with lime and one-third is distilled off to recover the alcohol and the balance is evaporated to dryness to recover the acetate which is dried.

The weak alcoholic product is redistilled in another still to produce 82% which product usually goes to refiners.

The principal reaction taking place in the charring of fibre is the breaking down of the carbohyrate into carbon and water The reaction is exothermic and with from 14% to 20% of water in the wood the reaction goes on with the application of little heat after action starts. Many attempts to use green wood have failed on account of the impossibility of getting heat into the interior of wood carbonized on the outside. Attempts to regulate temperatures by methods of heating or cooling retorts or of observing them by pryometers placed at various points outside the wood body are also useless as the exothermic reaction can only be controlled by having the proper amount of moisture in the wood itself where the temperature develops.

A cord of air dried beech, maple or other strictly hard deciduous wood will weigh about 2 tons and there will be produced from it a ton of aqueous pyroligneous acid which contains about 66 pounds of wood alcohol and 132 pounds of volatile acid estimated as acetic. In addition 15 gallons of tar will separate on standing.

To work this by the old process involves distilling a ton of water to remove about 2 gallons of tar. This was not tar when the operation began for by saturing the acid with sodium sulphate a layer of light volatile highly odorous oils will separate and on boiling they polymerize to tars. To distil off the whole body of pyroligneous acid, then to distil off one-third after neutralizing to reclaim alcohol

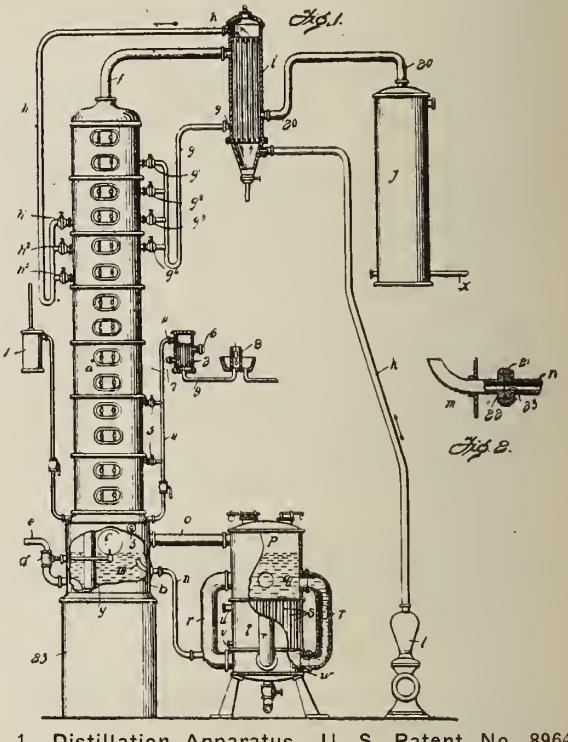


Fig. 1. Distillation Apparatus. U. S. Patent No. 896434.

and evaporate the residue for acetate means a double evaporation of 1 ton or an evaporation of 2 tons of water. To economize on this immense expenditure of fuel necessary the author devised an improved process.

Improvements in Producing Chemicals from Wood Distillation.

In 1906 two patents Nos. 824906 and 835501, and in 1908 patent No. 896434 were granted to the writer, the application date going back to December, 1904.

They embrace a process of distilling wood alcohol directly from crude pyroligneous acid in about 24% strength, evaporating the residual acid in multiple effect evaporators which also concentrate the acetate and the apparatus is disclosed and claimed. At this time the universal process used in wood distillation works were those previously described above. There was not in any wood distilling works any continuous column still nor any column still

[32]Ch. Ab., 1919, p. 2144.

[33]Teas, J. Ind. and Eng. Chem., 1915, p. 283, Vol. 7.

working on anything less than 80% alcohol and all the installations of these latter were put in by the author or followed those patterns. There was no installation of multiple effect evaporation whatever or any vacuum apparatus used nor was any exhaust steam used for any boiling work.

To remove the alcohol directly from the pyroligneous acid in any column still or any apparatus which would yield 25% alcohol had never been done before in the United States or described elsewhere. The patented process was worked by using a continuous still of the type known as "beer" stills as used in distilleries, but on account of the tar many modifications had to be made and it took four month's work after installation to get into successful operation. To avoid diluting the acid residue with water from condensed steam a boiler or "superheater" was attached.

This had never been done in the grain industry but was afterward extensively adopted there. The raw cold crude acid was continuously pumped in at the top and a distillate of about 25% alcohol was made. It would have been easy to have made 80% or 90% alcohol as is done in the grain alcohol industry but at this point many oil impurities will separate out which will not separate out in higher or weaker strengths. After removing these by settling it was found that by the addition of an excess of alkali that a number of aldehydes and ketones would polymerize and form "bakelite" with the phenols as creosotes, etc.

On distilling the thus purified liquid it yielded on redistillation in a similar still an 80% or 90% alcohol so free from oils that it was perfectly miscible with water as were all the subsequent distilled fractions.

On addition of such alkalies as lime to pyroligneous liquor a series of color reactions take place. At first the light straw colored liquid turns darker and greenish, then it turns a red which if strong is a deep purplish wine color. At this point it is neutral. This is the point at which neutralizations had previously stopped. But with this 25% distillate from which nearly all the acid was removed, and as the acetate was to be made from the other portion it was advantageous to add excess of lime. No one had previously recognized the importance of separating oils from an acid distillate of about 25% alcohol nor of then adding excess of lime to polymerize alkali sensitive impurities to produce perfectly miscible 80% crude. Many to-day do not recognize it and have produced 80% crude which defied purification to an extent necessary for making formaldehyde or dyes, or for other chemical purposes.

A somewhat long description has been given, but not as long as the lawsuit which has been pending for eleven years, and though all decisions have been in favor of the patent, the collection of damages still remains for settlement.

It may be said that nearly all the large plants in the West promptly put in infringing plants, but by appealing to the law they settled under duress.

It may be remarked here that the author never found any so-called business man who would recognize any intellectual property, whether covered by patent or not, unless compensation was forced by court mandate.

The acetate process here illustrated co-ordinated with the alcohol process uses the acid from which the alcohol has been removed. This hot pyroligneous acid containing about 6% acetic acid, 4% impurities forming tar and 90% water is placed in the first vessel, No. 18, of a multiple effect evaporator. All parts coming in contact with the acid or its vapors must be of copper. The acid liquor was distilled in the first installation at Ashland, Wis., by the exhaust steam of the furnace blowing engine, introduced at No. 19.

The acid vapors went through 22 to the "calendra," or heating chamber, of the second effect and were condensed here. The purified acid liquid was taken out and neutralized with lime in tub, No. 27, as in the old way described. The neutralized liquor was run through No. 28 into the second effect, No. 24, and was evaporated by the heat of the condensing acid vapors. Thus the acid was distilled and purified, and the acetate concentrated to the crystallizing point, using only exhaust and waste steam. This process made the manufacture of gray acetate of lime profitable in the Lake Superior region, where there were blast furnaces. Previous to that time most of the acid liquor was wasted, as it was said to be impossible to evaporate it at profit on account of the fuel necessary. The

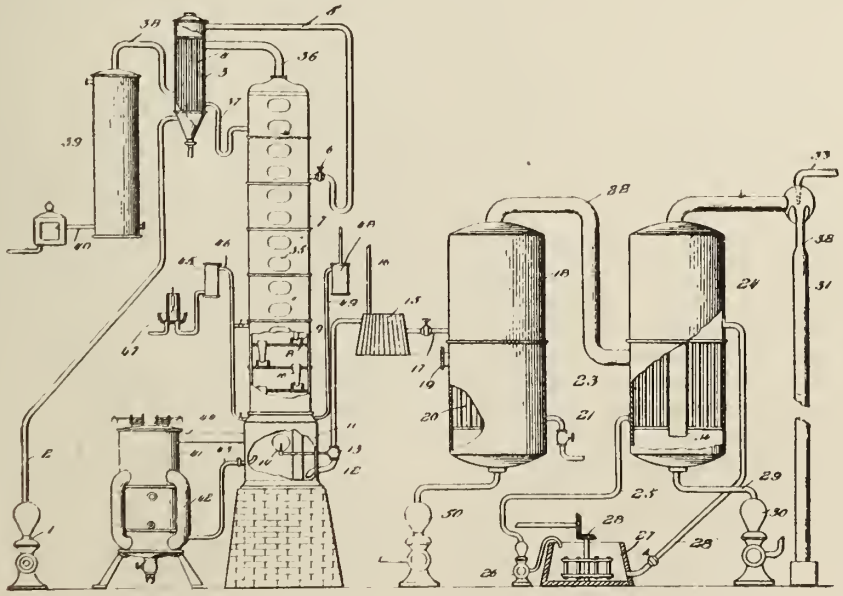


Fig. 2. Process of making Acetates. U. S. Patent No. 835501

Pennsylvania plants had natural gas for the work and they considered fuel as worth nothing then.

The advantages of the combined processes above are, first, that by removing the alcohol before attempting to put the liquid into a multiple effect vacuum evaporator that the high vapor pressure of alcohol does not interfere with the operation of the apparatus under vacuum. Second, the intermediate treatments of the alcohol produce a better refined article than can be made otherwise and the process is much more economical of fuel. By putting the acid liquor into the first apparatus and the neutralized liquor into the second only one of the vessels need be of copper, and the water from the second may be sent to waste and a jet condenser used. Broadly speaking, it may be said that the introduction of the continuous still and the multiple effect evaporator has doubled the production of alcohol and acetate.

Later, some apparatus to crystallize acetate and dry it has been introduced. The most important and novel apparatus is a woven wire mattress like belt which picks up the concentrated acetate in the meshes and carries it through a heated chamber and at the end the dried and agglomerated acetate is knocked off in little chunks. Another process uses the roll drier to partially dry the acetate which is then finished in a rotary. It is the author's experience that with proper skill acetate may be crystallized satisfactorily in the ordinary double bottom pans or pans with pipes in them. This may then be thrown into a rotary drier. Rotary driers were introduced successfully in 1900 for acetate, but attempts to use them as evaporators led to their final discard.

The statement has been put forth that the removal of the alcohol by pre-distillation from the acid leads to loss of acid in the distillate, but it is evident that any acetate in the residual liquor from the alcohol distillation may be evaporated and the acetate recovered. The water present in the alcoholic distillate was in the original pyroligneous acid and separating it into two portions does not change its volume.

Rectification of Crude 80% Wood Alcohol.

Wood alcohol is bought, sold and gauged on the Tralles scale, which reads percents by volume of grain alcohol. It is accurate for wood alcohol at 60° F. and at 99%, but not at other temperatures and strengths. The Guy Lussac scale is the same graduated at 59° C. The presence of oils or aldehydes, etc., dissolved in the crude, of course, interferes with the correct reading of the alcoholic contents.

The 80% crude alcohol made under the old processes or any process other than that described above is a pretty crude liquid usually containing oils in solution that will precipitate on diluting. It also contains about 25% of impurities eliminated in the heads, as they are more volatile than alcohol. They comprise acetone, acetaldehyde, and formaldehyde and oils. This mixture, when separated and purified by distillation and treatment with acids and alkali, is known as "methyl-acetone." The tails furnish methyl-ethyl ketone, now on the market, and some other oils which have such a rank odor they are not used. About 1 10 gal. per cord of allyl alcohol has been recovered.

In eliminating the impurities the heads or the fore-runnings form what is sold under the name of "methyl acetone," a mixture of methyl acetate 40%, acetone 40%, and methyl alcohol 20%. This has a specific gravity the same as 80% alcohol.

Methyl acetone has a constant boiling point of 55° C. and can be distilled over caustic soda with very little decomposition. By refluxing or superheating acetate of soda is formed and methyl alcohol comes off.

Though by iodine test it forms iodoform, indicating acetone, and the acetate indicates esters, it has different physical and chemical characteristics from a synthetic mixture of the pure products as above. For one thing it has none of the characteristic smell of acetone nor the fragrant smell of methyl acetate. The writer has never seen a barrel of pure acetone or methyl acetate known to be produced from this product, though small samples are reported to have been separated. During the famine of acetone in war times with the fate of nations hanging on acetone, no one produced an acetone from alcohol heads suitable for cordite. Though, perhaps, some methyl acetone was used in desperation, it was never confused with the pure article from decomposition of acetate nor did it work as well. It is a better solvent of many gums, resins, cellulose esters, and some other things than the synthetic mixture. For chemical works making formaldehyde and dimethyl aniline and other compounds, methyl alcohol is produced in large quantities 99% pure and with less than 0.10% acetone and remaining undiscolored on addition of permanganate and with caustic dissolved in it.

Acetate of Lime.

The old method of making acetate was by neutralizing crude undistilled pyroligneous acid, producing brown acetate of 60% purity. With HCl this makes a very satisfactory acetic acid and it produces an acetone with more higher ketone oils, but intumescence takes place to such an extent that its destructive distillation is troublesome.

Sulphuric acid acts on it with great decomposition, producing much SO_2 when acid is made from it, but with the prospects of increase in HCl in the future as a by-product of chlorination of organic compounds and in other residues perhaps the brown acetate will come back.

The gray acetate is made by neutralizing with lime the distilled pyroligneous acid and shows 80% purity on estimating acetic acid.

What the other 20% is the author does not know, and knows no one who does.

Acetic Acid.

The older process of making acetic acid was to distil gray acetate with sulphuric acid in a still[31] of cast iron and flat bottom set over a fireplace with copper neck leading to copper condenser. The still had a removable section at bottom to one side and the residual calcium sulphate was thus removed.

SO_2 and weak acid come over at first and the acid gets stronger till the still is nearly dry, when steam or water must be added to remove the last portions. The crude acids of varying strengths according to the time taken and amount of water added are re-distilled. A wooden still with a stoneware column or condenser is used, but a copper distilling column is better.

The crude acid distillates are separated according to strength and amount of impurities, such as SO_2 and pyrogenic matter, etc. After distilling a portion and evolving SO_2, permanganate or bichromate is added till no further immediate action takes place; the residual distillation is for stronger and purer grades.

The distillation of the stronger acid is done in copper stills with columns, and stoneware and glass have been substituted with some little success.

On distilling a solution of acetic acid of all moderate strengths in an ordinary flask the distillate will contain

[31] U.S. Pat. No. 535353 and 608019.

one-half the strength acid as the residue from which it was produced. Thus, there is, with any fractional distillation, a constantly stronger distillate till finally the residue, and consequently the distillate is glacial. The last stages are difficult and are best performed in glass. The rectification is best performed in a copper still and column. Vacuum stills have been introduced in late years, but are not of importance.

The commercial grades are No. 8, which is 28%, 60% and 80% waterwhite, which will stand permanganate without discolcring, and pure glacial of 99%.

100% grain vinegar is 10% acetic acid.

Until the war stimulated production all acetic acid except vinegar was produced from distilling acetate of lime from wood distillation.

During the war acetone production led to processes making acetates and acetone. The most important we will see at Shawinigan, where glacial acetic acid is made from carbide and for the glacial grade it promises to be a prominent factor in the market. It must be remembered that before the war acetate sold at $1.50 per hundred, making the acid contained worth 2.5 cents per pound, now with acetate at 3.5 cents it would be worth 6 cents a pound. But with the present price of alcohol, acetate will be sacrificed at any price and 3-cent glacial acid is possible from wood distillation, though it is hoped it will not be necessary.

Through double decomposition of calcium acetate with sodium sulphate a cheap acetate of soda can be made which with chlorine and sulphur chloride will make a rather cheap anhydride if commercial processes are developed to use it on a large scale.

Acetone.

Acetone is made from destructive distillation of lime acetate in three different forms of apparatus. The first is like the acetic acid still described as the apparatus was originally patented for acetone manufacture.

A large amount of acetone was made during the war with this apparatus and better yields and general results claimed than by other processes. The users of the other processes make the same claims.

The second process uses a rotating cylindrical retort with charging door and discharge in rear and in front trunnion is an escape for acetone vapors and gases which go to a condenser. Where natural gas is available these retorts give good results.

The third process was introduced by the Germans and consists of a retort and car exactly like the United States oven retort system, and could be made by using the drawings for these, and was probably so made after a visit of German wood distillation experts to the United States. The car has pans on it which are filled with acetate and rolled into the retort and distilled just as the wood is distilled. During the war no American wood distiller could be induced to use his oven retorts for making acetone, so badly needed. Though these are somewhat larger and the charge would probably take longer, there appears no reason why they would not function perfectly. The old round retorts are also well adapted to making acetone by putting in pans of the right shape to fit. None of these were used, however, though some were idle. There was, therefore, no necessity of constructing the large acetone plants built during the war, which are now idle and useless. If we had built more standard retorts more alcohol could now be made to supply the demand.

Competitive Processes.

The war has not resulted in any materially greater capacity of wood distillation plants, but has resulted in bringing out other processes of making acetone and acetates. A large installation near Baltimore distilled molasses and made vinegar or acetic acid from the alcohol by the old standard methods, long practiced at many places in the United States. The acid was neutralized with lime and evaporated and destructively distilled for acetone, using the standard rotary retort before described. Though there is no new step whatever except neutralizing acetic produced from fermentation instead of by wood distillation, the plant did not seem to work for several years well until one of our members took hold and fired the German management.

No acetates or acetone have been made by this process since the armistice.

The production of acetone from soda waste liquor has been mentioned, but none has appeared on the market.

At Shawinigan Falls we may see the acetone plant which now has historical interest only, as none has been produced for commercial work.

At San Diego the author had the pleasure of examining the very interesting process of fermenting seaweed to acetic and other organic acids and described it in Vol. 10, Trans. Am. Inst. Chem. Eng. It was a very attractive process, but closed down immediately the armistice was declared. It made acetone as one product, while potash was saved.

The Fernbach process of fermenting starch to normal butyl alcohol and acetone was developed at Toronto and at other places, and at Terre Haute it is being started again and will produce considerable acetone as by-product. The demand for fusel oil, made scarce by prohibition, results in the old distilleries being re-started up to make the butyl alcohol substitute.

It thus appears that while the market for wood alcohol seems attractive, that competition may appear on acid and acetone.

Wood Tar.

About 15 gallons of tar are produced per cord of wood distilled. Most of this is burned under boilers, though some oils are produced from which a little beech wood creosote is made and some is used in flotation of ores. The Forest Products Laboratory of Canada has investigated the wood oils for flotation of Cobalt ores and finds generally that by using twice as much hard wood oils as is necessary with pine oils about as good results may be obtained.

No research work on American hard wood tar has ever been done or published, and it is impossible to find any record of an analysis that is in any way complete or that will tell the substances contained in it and their proportion. There are a lot of statements that certain investigators have detected various chemical compounds in it; but whether they were traces or whether they comprised substantial amounts of the product is not stated.

Most of the published work refers to European tars produced from different species of trees that are used in the United States and Canada.

Charcoal.

As is well known charcoal was one of the most ancient fuels, for, one of our ancestors, who had come down from the trees, found that fire was a friend instead of an enemy as all other animals thought. When he made use of fire he performed the primary feat that lifted us above

the lower animals. Charcoal was the product of incomplete combustion and while glowing served to carry fire to the cave where needed. The first artist who preceded the Neanderthal man used charcoal for crayon. As much charcoal iron is made in America to-day as ever, but the vast increase in coke iron has made us forgetful of this.

A large amount of charcoal is used for domestic purposes, particularly in Canada.

The properties of charcoal in absorbing gases and decolorizing liquids were long known. Under direction of Col. Dunn, experiments were conducted some years ago that proved that charcoal from rotten or punky wood will, if slightly wetted, and a slow current of air is passed through it, ignite and burn, and this accounts for many cases of spontaneous combustion in charcoal cars.

In the obsolete process of making American whiskey it was customary to filter the 50% alcohol through charcoal and this was specially treated to activate it. Hard wood charcoal produced by the ordinary retort process was placed in a stone or brick kiln and ignited and burned till about 24% was consumed. This produced a very high temperature and the tar was thus burnt and steam might then be run in and the kiln closed till it cooled off.

This produced a coal probably as well activated as any that went into gas masks. It must be remembered that the Germans had nothing but hard wood charcoal for gas masks, but it was found to be remarkably efficient.

The Correlation of Forest Industries with Dendro-chemistry.

The chemical industries of the forest here described are all being worked at various places, but in too many cases they are not pursued as by-product industries. The tendency of the American is to go in for big plants and rapid production without regard to economy of raw materials which did very well when our resources were seemingly unlimited but that time is rapidly passing for all and has passed for many to their sorrow

The ideal forestry operation is one where every species of wood found in the forest is taken and every part is utilized for making chemicals or for producing heat if it is unsuitable to more profitable use. Every sawmill has potentialities in its wastes as material for chemical products and as fuel for chemical industries. When these are utilized there will be greater profits in the forest and it will furnish more useful products and part will be conserved for posterity.

Chemistry as a Business*

A Review of the Business Progress Made by Some Canadian Chemical and Metallurgical Industries.

CANADIAN INDUSTRIAL ALCOHOL COMPANY, LIMITED.

The Development of its Business and Prospects.

Within the last four years there has grown up at Corbyville, Ontario, probably the most modern industrial alcohol distillery in the British Empire. This distillery was established in the year 1859 in a small way and was operated for over a half a century in the production of beverage spirits; today this plant ranks as one of the largest industrial concerns in Canada, consisting of some sixty buildings of the most modern construction, covering thirty three acres of land. The distillery is located on the Grand Trunk Railway System three miles north of Belleville, Ontario, and is served by seven private sidings.

In the early days of the recent world war, the maximum producing power of this plant was drawn upon for the production of alcohol for munition purposes. It was soon found that the capacity of the distillery was totally inadequate to meet the ever increasing demands of the several powder plants. New stills, rectifying columns and storage were installed and erected, and the plant worked at full capacity day and night in order to continue the delivery of a steady stream of alcohol so essential in the production of gun powder. In 1916 the distillery (which had previously manufactured from grain) was equipped for the use of molasses in its processes and molasses was brought in from Cuba to New York, thence by tank cars to the distillery. In addition several tank barges were secured which brought molasses from New York via the Hudson River, New York State Barge Canal to Oswego, thence across Lake Ontario to Belleville. The alcohol was also delivered to the powder plants in tank cars and it was no uncommon sight to see forty to fifty tank cars move in and out of Corbyville in a single day.

In 1918, a new company, Canadian Industrial Alcohol Company, Limited, was formed, which Company purchased the distillery and has since carried on the manufacture of munition and industrial alcohol.

At the close of the war this Company was supplying the entire requirements of the British and United States Governments Munition Plants in Canada. In addition large quantities of alcohol were shipped to France for war purposes.

With the signing of the armistice came a cancellation of all war contracts and a temporary lull in distilling operations. During the following few months the Company enlarged its storage capacity for raw materials by building a new modern concrete grain elevator, also by doubling the molasses storage. The alcohol and molasses storage now runs into millions of gallons. Recently two complete distilling units have been added and the enormous development of the past few years has placed this modern distillery in the front rank of the industrial alcohol plants.

Since the termination of the war, the distillery has turned its attention entirely to the production of alcohol for industrial purposes. For months past, Canadian Industrial Alcohol Company Limited have been carrying on a large export trade. This alcohol is shipped in iron drums of 90 gallon capacity most of which travels through the port of New York in direct competition with the older established distilleries in the United States. It is in the domestic market, however, that this Company is chiefly interested. The consumption of alcohol for industrial purposes in Canada, although small at the present time, is expected to increase rapidly, and as the capacity of this plant is 6,000,000 Imperial Proof Gallons per year, it is in a position to supply not only present needs but also

*Contributed by officers of companies mentioned.

take care of such increase in consumption as may be expected for some years to come.

In recent years manufacturers in the various industries in Canada have been educated into buying their alcohol in bond as provided for by the regulations of the Inland Revenue Department, thereby placing themselves in a position to purchase newly made alcohol. This product can be supplied at a very low price as compared with the two year old alcohol which they had been previously purchasing. This has resulted in a large increase in the consumption of industrial alcohol.

During the last session of Parliament, amendments to the Inland Revenue Act were passed, which removed many of the restrictions from the use of alcohol in the Arts and Industries. Canadian manufacturers now enjoy practically the same privileges with regard to the use of alcohol as obtains in Great Britain, the United States and other progressive countries. Probably the most important result of the legislation was the handing over by the Department of Inland Revenue to the distillers the denaturing of alcohol. Hitherto the distillers furnished the Department with Ethyl Alcohol for denaturing, shipping the alcohol to the Department's methylating plant at Ottawa, where the denaturant was added. The Department then reshipped the finished product to the hundreds of purchasers and users of methylated spirits throughout the country. This method of handling the denaturing process could never be productive of the prompt and efficient service required in modern merchandising. The Canadian Industrial Alcohol Company Limited has made full preparations and is in a position to give this branch of its business the closest attention.

The distillery maintains a well equipped laboratory under the direction of experienced chemists. The several operations of the distilling process are carried on under the most accurate and up-to-date chemical control, thereby ensuring the production of the highest possible quality of alcohol. Through constant research work, improvement and advancement is continually being made in the processes. The research department is always ready to assist manufacturers using alcohol in working out any of their problems.

A very important forward step has been taken by this Company in the substitution of iron drums for oak barrels. High proof alcohol is a difficult commodity to handle; the finest coopered oak barrel will develop leaks causing loss while in transit, also deficiency in the proof strength. Railroad classifications and tariff rates have always ruled high on this commodity due to the numerous claims charged against the carriers for leakages. This Company is now shipping in both 90 gallon and 45 gallon iron drums, which packages are of heavy construction, all seams fully welded and absolutely air tight. This should prove a welcome improvement both for the purchasers of alcohol and the transportation companies.

The Company is keenly interested in the question of the possibilities of alcohol as a substitute for gasoline for power purposes. Its research department has been carrying on experiments along this line for some months past. The alcohol motor fuel question is becoming a very live one in various countries. In certain parts of the United States this fuel is being successfully used in automobile engines. The British Government are making thorough investigation of the question at the present time and it is understood that its tests are proving out very satisfactory. All this points to the fact that the Distillery at Corbyville is only in its infancy and that its future operations will be on a big scale.

The company is this year showing samples of alcoholic products suitable for various industrial purposes in the Industrial Chemical Section of the National Exhibition.

PROBLEMS IN THE DEVELOPMENT OF A LABORATORY SUPPLY BUSINESS AS SHOWN IN THE HISTORY OF CANADIAN LABORATORY SUPPLIES, LIMITED.

A railway train is a queer place for the birth of a Laboratory Supply House, yet that is precisely where "Canlab" was born, between New York City and Buffalo.

After visiting the Chemical Exposition in New York some time ago and discussing matters with a friend on the homeward journey, Mr. J. H. Wilson, "Canlab's" President, decided that Canada must have a Laboratory Supply House, of necessity small at first, but it had to be, small or large.

Canadian Laboratory Supplies Ltd. was actually started about eighteen months ago. When the stock arrived and was put on the shelves, there was not a solitary order on hand, not a name in the nice new sales books. To get the orders necessary to make "Canlab" a factor in the daily work of the Canadian Chemist, and to keep the goods from becoming old on the shelves has not been a very easy task.

The Canadian Chemist for many years has been accustomed to buying the most of his equipment on the other side of the line, or in Europe, and it has taken no small amount of demonstration to convince him that he could purchase the same goods in Canada to his advantage. As already mentioned, when this company started operations, they had to find customers, having little or no connection to begin with. To-day however, the story is different "Canlab," thanks to the Canadian Chemist, has progressed to the point where the problem now is to take care of the business in hand, and it is indeed a problem with the uncertainty of supplies, ever-increasing costs, labour troubles, and all the items that go to make business what it is to-day.

Some two months ago the manufacturing and repairing of chemical glassware was started, being the first real attempt to manufacture anything of this kind in the Dominion. This department will in the very near future be of a great service to the chemist in this country. It means that when he needs special equipment, something to be made from sketch or blue-print, it will not now be necessary to go abroad. It can be done at home, at less expense, showing as good workmanship.

Behind this development are men who thoroughly understand the laboratory supply business. In this way the problems that occur from day to day are ably dealt with.

Mr. J. H. Wilson, President and Manager, has had many years experience in this one business, almost nineteen years, a considerable part of this time being spent in Scotland and England with the well-known firm Baird and Tatlock, Ltd.

Make yourself known to "Canlab" at the Canadian National Exhibition where "Made in Canada" laboratory glassware will be shown.

THE ABBOTT LABORATORIES ESTABLISHED IN TORONTO.

The Abbott Laboratories have been long known as large manufacturers of fine medicinal chemicals. They have recently organized in Canada, and are preparing to pay

special attention to the development of Canadian business. When the opportunity came they began to manufacture a number of products not previously manufactured outside of Germany, and the manufacturing end of their business has grown rapidly in the past five years. Many of these products are manufactured under license. The chemistry involved in their production has given opportunities for much research work, and the company is co-operating this year in the Industrial Chemical Section of the National Exhibition, showing the drug and pharmaceutical end of the chemical business.

The Abbott Laboratories were the first to present to the medical profession the popular Dakin line of Antiseptics, including Chlorazene, Dichloramine-T and its solvent, Chlorcosane. Mr. H. P. Dowling has been appointed as Canadian Manager.

T. E. O'REILLY LIMITED.

The business of this organization consists chiefly of the representation of manufacturers, for the sale of their products throughout Canada.

At the present time they enjoy the privilege of representing ten very large and influential manufacturers of the United States and three in Canada, and they are now seeking to develop connections from England and other European Countries.

The policy of T. E. O'Reilly, Limited, in the past has been to follow out the wishes of the principal, in either selling the goods on a small commission basis, or purchasing same outright and re-selling them, and this policy is still maintained. They enjoy a very close connection with the leading Wholesale Houses interested in their lines, such as, Drug Houses, Rubber Companies, Textile Mills, Paint, Oil and Varnish Houses, Soap Companies, Packers, Glass Companies, Essential Oil Manufacturers, Tanners, Paper Companies and other Sundry Industries.

Their policy is to sell to the Wholesale Trade only, and in the start of this Company, a few years ago, they had as a foundation a very close working connection with one of the large chemical manufacturers in the United States, and with the growth of the business throughout the Dominion, this organization has kept growing, and at present is handling a turn-over of approximately two and a half million dollars per annum ($2,500,000.).

The principle of their organization at the present time is having the work divided, so that they have what might be called, department managers, each having a thorough knowledge of the particular class of trade which he is covering.

It has been the policy of T. E. O'Reilly, Limited, to make the work as pleasant as possible for all employees, and in the case of the men in charge of the different departments of the work, an interest in the Company is given them, as well as a substantial bonus at the end of the year, making it interesting and worth-while for them to develop as large a trade as possible with their own ability.

As for growth of the business, the executive plainly discern that Chemicals are entering, on the whole, on a much larger and broader scale into Canadian industrial life, and the outlook is very encouraging for expansion in almost every line.

By reason of the lines they handle, and the class of trade with which business is done, they are placed in a position of advantage to see the rapid growth of the different industries and concerns to whom they were selling only a few thousand dollars' worth of goods a few years ago, and who are now, in many instances, taking ten times as much annually.

T. E. O'Reilly, Limited endeavor to handle the business entrusted to them for their principals in the most careful manner, and realize the necessity of quality and service as well as price, in maintaining their fast-growing business.

BRUNNER, MOND CANADA, LIMITED
Alkali Manufacturers.

Though one of the youngest of Canadian Chemical industries, its Soda Ash plant at Amherstburg having only started operation on October 1, 1919, Brunner, Mond Canada, Limited, is already justly characterized as a "Key" industry of the utmost national importance.

Soda Ash, or Carbonate of Soda, the principal product of this Company, as is known to most chemists and some few laymen, is a commodity of the most general use and supreme importance in industrial and economic life. The scope of its uses it is impossible to enumerate in an article of this character, but its position may be comprehended when one realizes that in importance it is said to rank second only to pig iron, and that the processes at present employed in the manufacture of glass and soaps have been built up by the use of Soda Ash as a principal ingredient to such a degree that an ample, constant and

Plant of Brunner, Mond Canada, Limited, Amherstburg, Ontario.

reliable supply of this commodity is absolutely vital to the successful operation of these industries, and in addition that Soda Ash enters to almost as great an extent into the manufacture of paper, wood pulp, chemicals, drugs, paints, leather, enameled ware and cleansers of all kinds, and is also used extensively in the textile industries, in dyeing and metallurgical operations, in the refining of vegetable and mineral oils, in metal working, water softening and laundry operations, and, in fact, in one way or another in almost all modern manufacturing processes, besides its use in almost every household in forms of sal soda, cleansing sodas, washing powders and bicarbonate of soda, so that in some of these forms it enters many times each day into the life of almost every one in the civilized world. It has another use of deepest importance, as was realized during the war, as it enters very largely into the manufacture of most modern high explosives.

This Company's plant is the latest and probably the most modern of its kind in the world. It is located at Amherstburg, Ontario, on a tract of something over 600 acres, with an apparently unlimited supply of raw materials close at hand, and from these raw materials, hitherto unexploited natural resources of the Dominion, it is successfully manufacturing Soda Ash to an extent sufficient to supply the entire Canadian demand. Prior to the completion of this plant Canada was dependent for this commodity, on which so much of her economic and commercial development depends, upon other countries, her entire supply being imported from beyond her own borders. Now that this plant is completed the manufacturers of the Dominion are assured of having available within their borders a reliable source of supply for the entire Dominion requirements, and in fact today a large part of the Soda Ash consumed in Canada is Canadian made, a tribute both to the energy of these manufacturers and to the loyalty of the consumers.

That this source of supply may go on uninterrupted and appreciating the marked development in Canadian industry, engendered in no little measure by the policy of Canadian manufacturers to patronize home products, Brunner, Mond Canada, Limited, are now engaged in extensive additions to their Amherstburg plant, fulfilling their earnest endeavors to provide adequately for the Canadian market at all times.

THE MANUFACTURE OF SPECIAL INSTRUMENTS, FURNACES AND NICKEL ALLOYS IN CANADA.

Hiram Walker & Sons Metal Products, Limited, Walkerville, are developing one of the most highly specialized Canadian industries. This company was first organized in 1909 under the name of Canadian Hoskins Limited, to manufacture in Canada the lines covered by the Marsh patent, covering Nickel Chromium Resistance Wire, Nickel Chromium Pyrometer Couples, Electric Furnaces using nickel chromium units, and Carbon Resistor Electric Furnaces, such as are commonly known as the Hoskins Furnaces.

Until 1914 the operation of the Company were intermittent, but on January 1st, 1914 under the name of Canadian Hoskins Limited, the manufacture of a full line of furnaces in Canada was begun. In 1916 the manufacture of Nickel Chromium Resistance Wire under the Marsh patent and the trade name Chromel was started, and to-day this company supplies the largest manufacturers of electric devices in Canada, and a number in England with electrical resistance wires.

In furnace manufacture of Hoskins type, all sizes in laboratory furnaces are made and two muffle and crucible shapes for temperatures varying from 500° to 3600° F. Besides these, electric tools, annealing furnaces, oil tempering furnaces and electric furnace equipment for tool rooms are produced.

In 1918 Nickel Chromium heat resisting castings were added, and this Company now supplies these to the United States in the form of carbonizing and annealing boxes. This alloy is known by the trade name Nichroloy.

In 1919 a Nickel Copper Non-Corrosive Alloy was produced from which castings are supplied oil trades, chemical plants, power houses, or in general, places where metal having a high resistance to corrosion from super-heated steam or dilute acids is required.

The production of Nickel Chromium Wire has been developed at this plant. A special process is being operated for drawing this wire.

Each year sees the results of progressive work, and just recently this Company has produced a new resistance alloy for moulding zinc and lead. At present the alloy foundry has one alloy furnace for making various nickel alloys and complete foundry equipment for handling metals. A complete laboratory is maintained and a group of experimental electric furnaces for general testing of pressed alloys and for research work. Nickroloy Synthetic Monel Metal and their latest alloy was developed in one of their own Hoskins type A.B. 105 Electric Furnaces. It has a maximum temperature operating condition of 3600° F. and a capacity of 25 lbs.

These developments based on Canadian resources show that in the most specialized metallurgical fields it is possible for a company to expand and compete in research, and do a world wide business from within the Dominion.

SELLING NON-GERMAN DYES IN CANADA.

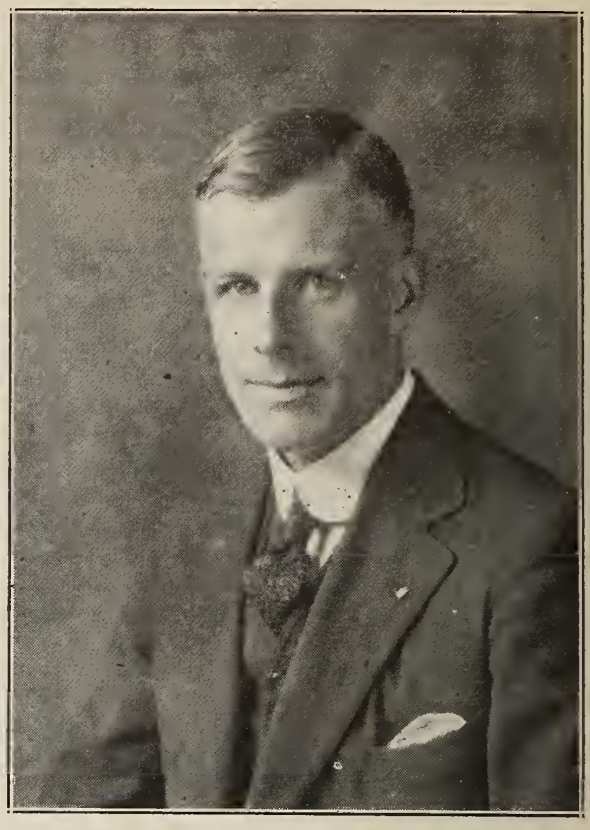
Watson Jack & Company, Limited, Montreal, have very good reason to doubt whether any other firm, dealing in colors in Canada, can trace their history as far back as 1869. At this date, just ten years after the discovery and introduction of aniline dyes, the firm of Middleton and Meredith was founded, to import dyes and chemicals for the textile and leather industries

Mr. Watson Jack entered this firm in 1885, and continued with them until the death of W. H. Meredith in 1896. The name of the firm was then changed to Jack and Robertson, and continued as such until the retirement of Mr. A. G. Robertson in 1901. From then on the name of Watson Jack and Company was adopted. In 1914, Mr. Watson Jack incorporated the Company under a Dominion Charter, associating with himself in the Company members of his staff who had given years of service to the business in the earlier days of development.

During these years, imports of colors to Canada have followed the great growth of our textile industries. While it is usually considered that all dyes sold in Canada previous to the war came from Germany, it should be known, and is indeed a striking fact, that this firm has represented Swiss color manufacturers for thirty years. Prior to the world war and against massed German competition, they were among the largest distributors of aniline dyes in Canada.

In 1890, they were appointed Canadian representatives of the A. Gerber & Co., Basle, Switzerland. In 1898, an

MR. WATSON JACK,
President Watson Jack & Company.



MR. JAS. A. TAIT,
Sales Manager Watson Jack & Company.

amalgamation of these works and the Society of Chemical Industry, Basle, was consummated, and the representation in Canada continued. A united system of plants in England and Switzerland makes the organization well able to maintain its development.

MR. W. R. ALLEN,
Managing Director Watson Jack & Company.

The history of these companies, and in Canada the progress of Watson Jack Co., Ltd., has been a complete answer to the German propaganda now familiar history to everyone. The doctrine that only one people could make aniline dyes successfully has been destroyed, and no effort has been spared on the part of this company in placing the situation before Canadian textile users and the public.

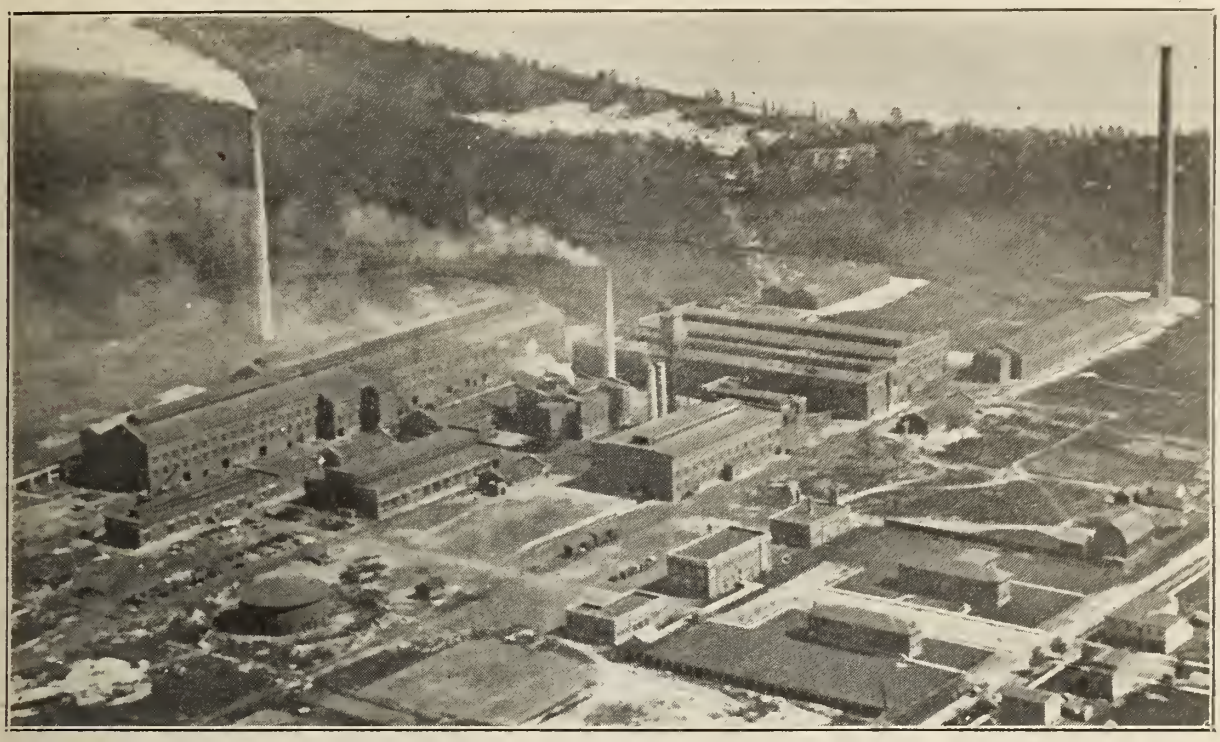
Watson Jack & Co., Limited, are having an exhibit in the Chemical Section of the Exhibiton. This will be of a highly educational and attractive nature, showing the latest application of dyes to products from Canadian mills. By courtesy of this company, arrangements have been made for temporary offices of the Society of Chemical Industry at the Exhibition, where all interested in the Section will find a representative present.

Mr. W. R. Allen, a graduate of Yorkshire College (now Leeds University), in 1896, became associated with the firm in 1898, becoming a Director in 1914. He is well-known in chemical circles.

Mr. James A. Tait, head of Sales Department, has been with the Company since 1905.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED.

In this number there is an aerial photograph of the Port Colborne, Ontario, Refinery of The International Nickel Company of Canada. This Refinery was constructed during the years 1916 to 1918, and the first cast of finished nickel was made on September 15th of the latter year. Since that time the Plant has been in full



Aerial Photograph of Refinery of International Nickel Co. of Canada at Port Colborne, Ont.

swing. It has at present an annual capacity of fifteen million pounds of nickel, and seven million pounds of blister copper. Due to the lack of a Canadian market, the majority of this material is exported.

The Plant is treating a high grade copper-nickel matte produced at the Copper Cliff Smelter of the Company. The "Orford" process of nickel refining is used. Large Quantities of coal, coke, charcoal, fuel oil, nitre cake, soda ash, sulphuric acid refractory brick and fire clay are consumed.

The products of the Refinery are nickel, in shot and ingot form (of a purity of 98.5 to 99%), nickel oxide and blister copper.

Wherever possible, operation and handling of material are by mechanical means, and every care has been taken to insure safety and sanitation.

The Plant was constructed at a cost of over five million dollars, and it admirably completes the operations of The International Nickel Company of Canada.

ELECTROLYTIC ZINC AT TRAIL.

By F. H. Mason.

In the March issue of this Journal, Mr. R. W. Diamond, superintendent of the concentration plants for the Consolidated Mining and Smelting Company, at Trail, B.C., gave an account of the recent improvements in the methods of concentration that had been made for the dressing of the company's Sullivan mine ore. From present indications there is every reason to believe that the Sullivan mine, at Kimberley, B.C., is likely to become one of the greatest zinc-producing mines on the continent. Realizing this, the company has not spared expense in devising a process for the treatment of this unusually complex ore, and the treatment subsequent to concentration probably has been as important as the concentration itself in bringing about a successful solution to a very difficult problem. Mr. Diamond already has dealt with the method of concentration; it is the purpose of this article to show the process by which the company produces commercial spelter from the concentrate.

It should be said, in passing, that the Consolidated Company is a pioneer—so far as this continent is concerned, at any rate—in the production of zinc by an electrolytic process. Experiments toward this end were started in 1912, and, though they were dropped for a short period, they were taken up again before the war, and pushed to a successful end. So it was not, as many have supposed, the prevailing high price of zinc during parts of 1916 and 1917 that enabled the company to devise this process, and, as a matter of fact, the Imperial Munitions Board made a contract to take the whole of the company's spelter output at 15 cents per pound at a time when zinc was being sold in the United States at 27 cents per pound.

The concentrates from the wet magnetic and Minerals Separation plants, which contain from 25 to 30 per cent. of zinc and 12 to 15 per cent. of lead, are roasted in 13 Wedge roasters, each having a capacity of 40 tons of concentrate per day. Considerable care has to be taken during the roasting, because, for reasons that will be explained later, it has been found that the best subsequent results are obtained from a calcine that contains about three per cent of the zinc in the form of sulphate and the rest in the form of oxide. The roast, therefore, is conducted with this end in view. Practically all the lead is converted to sulphate.

The solution of the zinc takes place in two batteries of five pachucas each, known respectively as the acid and the neutral pachucas. These pachucas are immense circular wooden vats, 30 feet high and 10 feet in diameter, with conical bottoms. A large pipe that does not reach either quite to the top or to the bottom is suspended in the centre of the vat, and a small pipe conveying air under pressure enters the bottom of the larger pipe and sends a jet of air up it. This jet of air keeps the ore and solution in continuous motion up the pipe and down on the

outside of it, thus exposing every particle of the calcined ore to the dissolving action of the solution. The solution of the bulk of the zinc takes place in the acid pachucas, and in these a small amount of the iron and other metals that are contained in the calcine also become dissolved. The solution, after the removal of the solids, goes to the neutral pachucas, where fresh calcine from the roasters is fed in. The oxide of zinc in the fresh calcine neutralizes any acid in the solution, and precipitates iron, arsenic, antimony, et cet, zinc going into solution in their places.

Precipitation of Copper and Cadmium.

From the neutral pachucas the calcine and solution go to a classifier; the slime from the classifier goes to a thickener; and the overflow from the thickener is treated with atomized zinc for the precipitation of copper and cadmium, after which it is filtered and pumped to reserve tanks and forms the electrolyte from which the zinc is precipitated. The sand from the classifier and the underflow from the thickener are pumped to the acid pachucas and are treated there with fresh spent electrolyte from the zinc precipitating vats until the whole of the zinc oxide is dissolved.

From the acid pachucas the residue and solution go to a classifier; the sand from the classifier goes to a ball-mill and thence to a Minerals Separation machine, where any unroasted zinc or lead sulphides are separated and returned to the roaster. The tailing from the Minerals Separation machine, which consists principally of lead sulphate and oxide of iron, is washed, de-watered, and sent to the lead smelter for the recovery of lead and silver. The slime from the classifier goes to a thickener; the underflow from the thickener goes to the lead smelter for the recovery of lead and silvr. The overflow from the thickener goes through an American filter, the solids going to lead smelter and the filtrate going to the neutral pachucas. The process is decidedly intricate, and the course that the calcine travels may perhaps be followed more easily on the flow-sheet that accompanies this article.

How Zinc is Precipitated.

The main feature in the successful preparation of the electrolyte is that all the iron in the solution that goes to the neutral pachucas shall be in the ferric state, thus insuring its precipitation by zinc oxide in the fresh calcine. A little chloride is kept in the circuit in order to precipitate

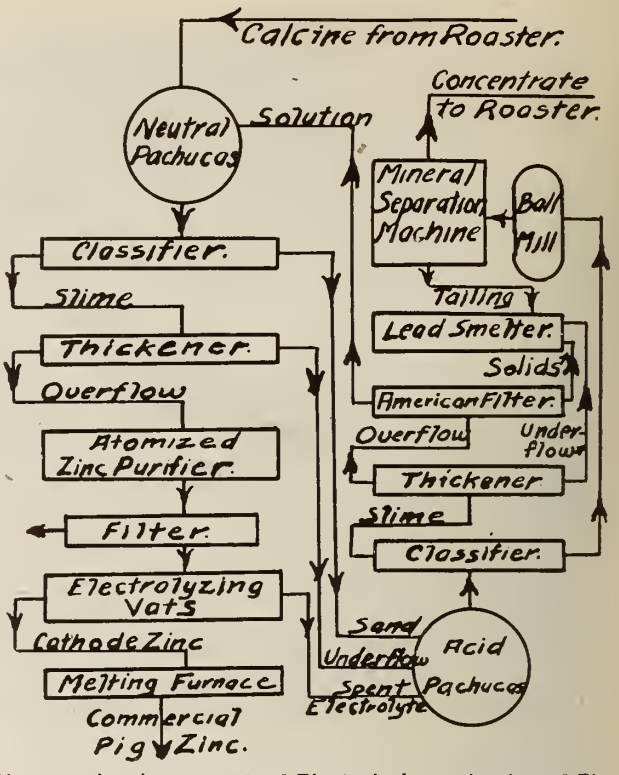


Diagram showing process of Electrolytic production of Zinc.

any silver that may have been roasted to sulphate and consequently to have gone into solution.

The electrolyte, thus prepared, is a neutral solution of zinc sulphate, together with sulphate of lime and magnesia, which have been dissolved from the calcine, but which do not interfere with the electrical precipitation of the zinc. The excess of these last two salts automatically crystalize out of the solution. The electrolyte contains about 55 grammes of zinc per litre. The zinc is precipitated from the solution in two huge vat rooms, containing 424 rectangular vats arranged in rows of eight vats each. Each vat contains 18 sheet lead anodes and 17 sheet aluminum cathodes, and each anode and cathode has an area of ten square feet exposed to the electrolyte. Thus each vat has a cathode area of 170 square feet. An electric current of 25 to 27

The plant of Consolidated Mining and Smelting Co., at Trail, B.C.

amperes causes the precipitation of the zinc from the solution onto the cathodes. The electrolyte enters the top vat, passes between the anodes and cathodes, and is then syphoned into the next vat which is a few inches below the first one. In this way it passes slowly down the row of vats, and leaves the last vat still containing about 22 grammes of zinc per litre. The reaction that takes place may be expressed by the equation:

$$2\ ZnSO_4 + 2\ H_2O = 2\ Zn + 2H_2SO_4 + O_2$$

As a matter of fact, however, more water is decomposed than is shown by the equation. There is a little sulphate of manganese in the solution that has been dissolved from manganese in the calcine, and this is gradually decomposed by the oxygen given off from the anode and manganese dioxide is precipitated on the anode and has to be cleaned off about every two months. The spent electrolyte goes to storage tanks and thence to the acid pachucas, as required.

It is at this point that the object of leaving about three per cent. of the zinc in the roasted ore as sulphate will become evident. It has been found by experience that this quantity sustains an even balance to the solution, providing neither too much nor too little sulphuric acid for the dissolution of the zinc oxide in the calcine. Should the zinc sulphate fall below this amount, sulphuric acid has to be added to the solution; should it rise above, some of the solution would have to be removed. This, of course, must not occur, as the spent electrolyte contains considerable zinc, and its removal would entail loss Except what is mechanically lost, the same solution is used over and over again, and some of the original solution is supposed still to be in the circuit. This however, probably is like the schoolboy's knife that had been rehandled and rebladed so many times that it was impossible to tell what part of the original remained.

Electrolytic versus Retort Process.

From 20 to 24 pounds of zinc is deposited on each cathode every 48 hours, and at the end of that period the cathodes are removed from the vats. A sharp tap on the top of the cathode loosens the deposit of zinc, which is then readily stripped off with a chisel-pointed bar. A workman will strip a vat load of cathodes in a few minutes. The cathodes are cleaned and replaced in the vats. The deposit of zinc is even and compact, forming a sheet that is readily handled. The sheets of zinc are loaded on trucks, which run down to the furnace room mostly by gravity. There they are melted and cast into pigs. The dross is skimmed off from time to time and freed from zinc in a rotary shaker.

It has been demonstrated that, given cheap electric power, the electrolytic process will compete successfully with the retort process and will produce a purer article. Since the commencement of operations up to the end of last year, the Consolidated Company has produced 75,601,389 pounds of zinc in its electrolytic plant, 30,743,461 pounds of which was produced during the 15 months ended December 31, 1919. A period of 15, instead of 12 months, is given here because the Consolidated Company changed the date of the termination of its fiscal year from September 30 to December 31 last year, and made up its records for 15 months, instead of for 12 months, as heretofore.

I desire to acknowledge the courtesies extended to me by the Consolidated M. & S. Company's staff in giving me access to the plant and every help in the preparation of this article.

PERSONALS

A personal note to our readers—If you are human, and most chemists are, you will readily admit that you are always interested in the professional activities of your friends. You, no doubt, often wonder if Bill So and So is still with a certain company, or if he has moved to another field or department; and our aim is to make this Personal column the place where you will find such information. But we cannot call personally at every plant and get it. Will you not just drop us a line or two telling us of any changes you have made, or that any of your friends have made. This is information we cannot get unless you send it in. Be big enough to do this little thing. And you fellows who have just graduated and secured positions write us telling where you are located. Simply mark your item for the "personal column."

Dr. R. D. McLaurin, formerly of the University of Saskatchewan, has taken a position with Wm. Davies Company at Toronto.

Mr. Earl Stafford has recently become a member of the engineering staff of Arthur D. Little, Cambridge, Mass. Mr. Stafford has devoted his attention largely to hydro-electric developments with particular reference to ore treating plants, pulp and paper mills and light and power companies.

Professor Victor J. Harding, of McGill University, has been appointed Professor of Chemical Pathology in the Faculty of Medicine, Toronto University, succeeding Dr. Andrew Hunter. Dr. Harding is a D.Sc. of Owens College, Manchester, England, and has been associated with McGill for the past nine years, having published a number of valuable papers on biological chemistry.

Mr. N. C. McFarlane, B.A., has joined the staff of the Mining, Metallurgical Division of the Dominion Bureau of Statistics, where he will be engaged for the next few months editing reports on the chemical industry in Canada.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

The month of August is always a quiet month in the chemical business, as in many other lines. There has been some talk in certain quarters of the market that things were unusually quiet just now, and some even entertained fears that "hard times" were on their way again, sending business to the dogs generally, and, indeed, presenting a gloomy picture all around. A somewhat detailed investigation of present market conditions in chemicals reveals that such fears are not based on fact. In interviewing many well known chemical business men, within the past few days, not one could be brought to say that the present month, August, was any quieter in business than August of last year. It is admitted that there may be a slowing down of business in all lines this coming winter, due to the inroads made on companies' financial resources by high-boosted wages, increased freight rates, etc.

Bleaching Powder—Lack of coal and the high price paid for it when obtainable is the chief factor in the jump in

Ninety Per Cent. of Fires are Preventable If You Are Prepared.

Chemical plants, by the very nature of their operations, are liable to fire damage. Quick action in the first three minutes will save many a conflagration.

We have fire prevention appliances of all kinds, but call your attention here to the

COLONIAL ONE-QUART FIRE GUN

It is the thing for an ever-ready emergency first-aid that any one can use.

Puts out fire of any kind, no matter how highly inflammable may be the material burning.

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It is accurate in aim and you don't have to keep pumping it. The pressure compounds, making continuous pumping unnecessary.

Approved by the Underwriters Laboratories, Inc.

Carried in the automobile it reduces fire insurance rates 15 per cent.

Price only $8.00 each. Discounts for quantities.

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Sesame, Cocoanut	PHARMACEUTICALS	FRUIT JUICES
COTTON SEED	PHOTOGRAPHIC	LARD, GLUE, TALLOW
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bleaching powder, a cent a pound, during the month. Present quotations are from $4.50 to $5.50 per 100 lbs.

Alum—Alum continues high owing to scarcity, largely due to the large amounts used this year in the southern states in water supply service.

Pharmaceuticals—In the pharmaceuticals bromides have been the most noticeable factor during the month, their price having dropped over twenty cents a pound. This has been due directly to the effort of American manufacturers to offset the flooding of the country by German bromides, which was recently attempted by some New York brokers. The brokers now have a nice stock of German bromides on their hands.

Oils.

Crude oils have advanced sharply. Supplies are scarce, and it will not be long before the refined products go up. Oil is needed as never before, and so far none has been brought commercially from the Canadian west. While it is true that good results are being obtained from new wells in Dover township, Kent county, Ontario, yet their supply is in reality but a drop in the bucket compared with the total demand for oil to-day.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Alum, Ammonia, lump and ground	100 Lbs.	.. — 7.00
Ammonium Bromide	Lb.	.. — .92
Aluminium Sulphate, high grade, bags	100 Lbs.	5.75— 6.00
Ammonia, Aqua 26	Lb.	.10½— .12
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—50.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	4.50— 5.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	45.00—50.00
Camphor Monobromate	Lb.	.. — 5.75
Carbon Bisulphide, in drums	100 Lb.	.14— .16
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, drum	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.. —.10¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.17— .19
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .22
Magnesium Sulphate	Lb.	.05½—.06½
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—110.00
Mag. Sulphate, B.P., Medicinal, car lots	Ton	85.00—90.00
Mag. Sulphate, Tanner's Canadian Salts, car lots	Ton	75.00—80.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .98
Potassium, Bromide, granular	Lb.	.. — .92
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — ..
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash). Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	4.00— 4.50
Sodium, Bichromate, bbls.	Lb.	.40— .45
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.. —.04¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.25— 2.50
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.08½— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —45.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.06¼— .07
Acetic acid, refined	Lb.	.. — .21
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.35— 1.40
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .80
Formaldehyde	Lb.	.75— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		3.50— 4.50
Oxalic Acid	Lb.	.. — .65
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	.. — 3.00
Quinine	Oz.	.90— 1.00
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .45
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .33
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23½
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.10¼
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50

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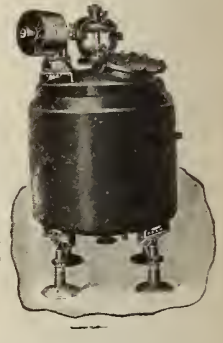

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Glass Lined Steel. The body of this tank is a single piece of Open Hearth Sheet Steel. The entire interior as well as the agitator is enameled with Pfaudler Glass Enamel. Capacity of tank shown 200 gallons, and is 42 ins. x 36 ins. inside. It may be had in many different sizes and capacities up to 800 gallons.

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Pfaudler Jacketed Still:

Glass Lined Steel. Tapering Gooseneck. Jacket and Enameled body of still are welded into one piece: top head bolted on and fitted with sight glasses; manhole cover secured by either swing bolts or through bolts. Tapering enameled gooseneck bolted to welded-on flanged nozzle in head. Flanged or threaded outlet through stuffing box in bottom of jacket. Various sizes and capacities.

Pfaudler Crystallizing Pan:

Glass Lined Steel. The glossy lining of Resistive Glass Enamel minimizes the chances of adherance of solids, and its non-metallic character eliminates the possibility of contamination from the pan. Various sizes and capacities.

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Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	3.15— 8.50
Tin	Lb.	.58— .60
Zinc, sheets	Lb.	.. —.18½

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Motor Gasoline	Gal.	.. — .40
Motor Gasoline (service stations)	Gal.	.. — .43
Lighting Gasoline	Gal.	.. — .45
Naphtha	Gal.	.. — .39
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .18
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

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Rosin, Grade W.W., in 280 bbl. lots		.. —22.00

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Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .32
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots ....(Imp.)	Gal.	.. — 2.52
Linseed Oil, boiled, in bbl. lots ...(Imp.)	Gal.	.. — 2.53
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .21
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

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Steamed Bone Meal	Per Ton	65.00—70.00
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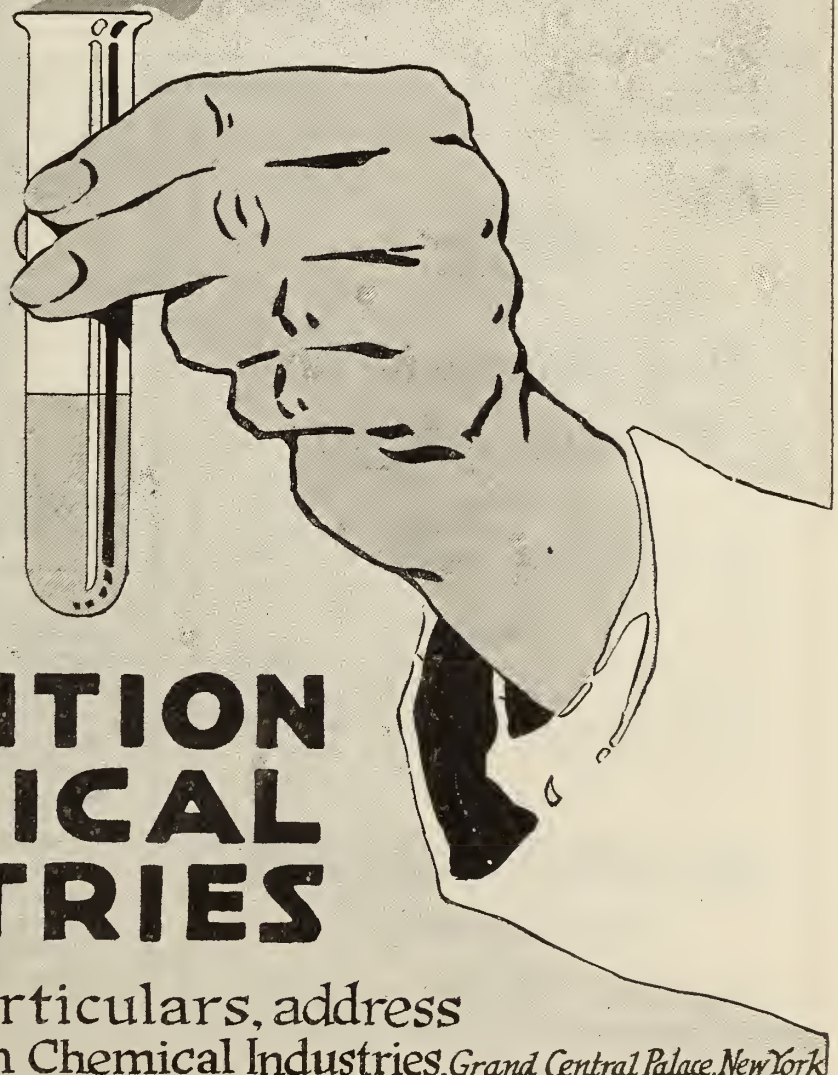

SIXTH

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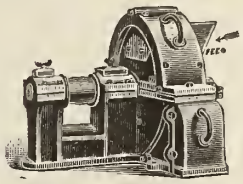

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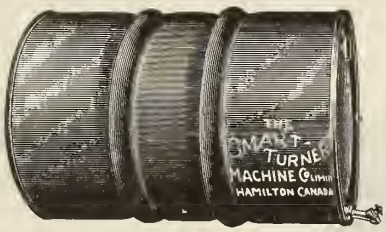

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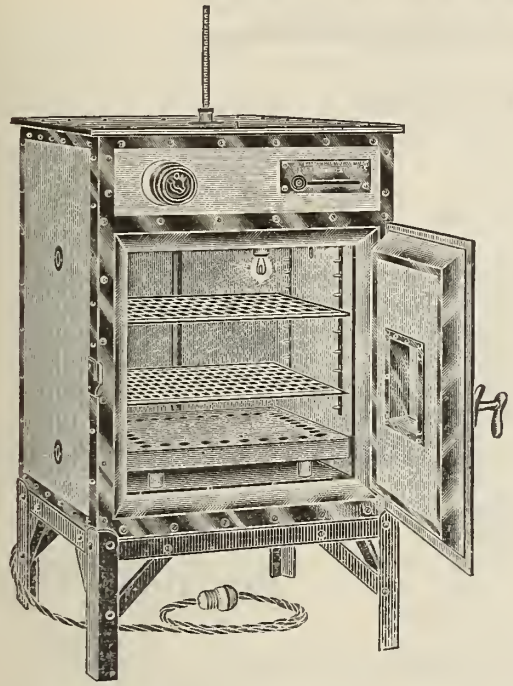

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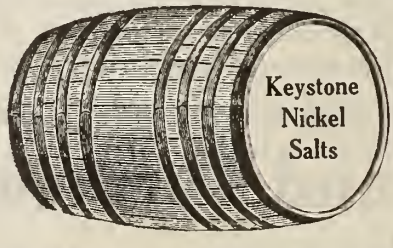

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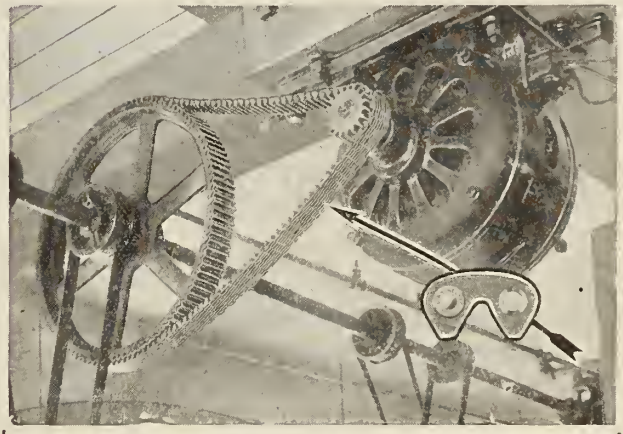

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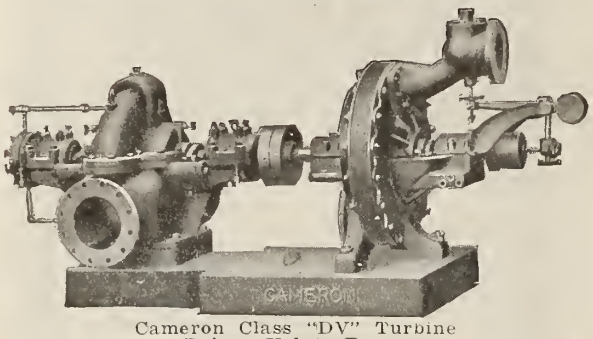

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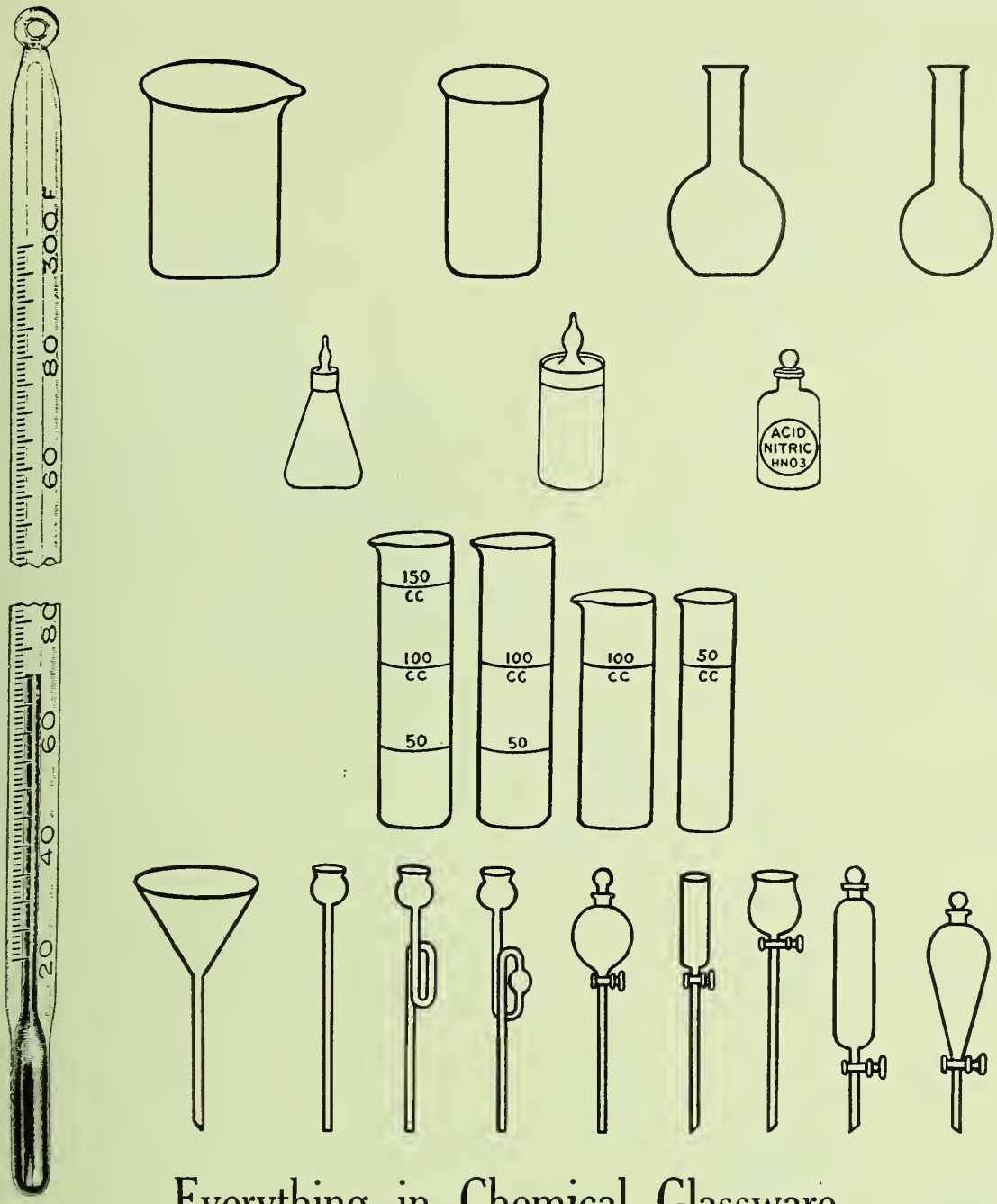

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Ontario, in 1919, produced 38 per cent. of the total mineral output of Canada.

Summary of Mineral Statistics, 1919.

Product.		Quantity.		Value.	
Metallic:		1918.	1919.	1918.	1919.
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, holow building		.....	.....	195,598	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,726
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc.		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	$80,308,972	$57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

Dividends and **Bonuses** paid to the end of 1919 amounted to $15,545,238 for gold mining companies, and $78,335,943 for silver mining companies, or a total of $93,881,181.

Publications:

For illustrated reports, geological maps and mining laws, apply to

THOS. W. GIBSON,
DEPUTY MINISTER OF MINES,
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METHYLATED SPIRITS
(Denatured Alcohol)

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HEAD OFFICE - MONTREAL CANADA

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Branches of Industry in which the Hess-Ives Tint Photometer is now being used are as follows:

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DEVINE

1920
SIXTH
NATIONAL
EXPOSITION
OF
CHEMICAL
INDUSTRIES
GRAND
CENTRAL
PALACE
NEW YORK
CITY
WEEK OF
SEPT. 20th
OUR BOOTH
No. 15

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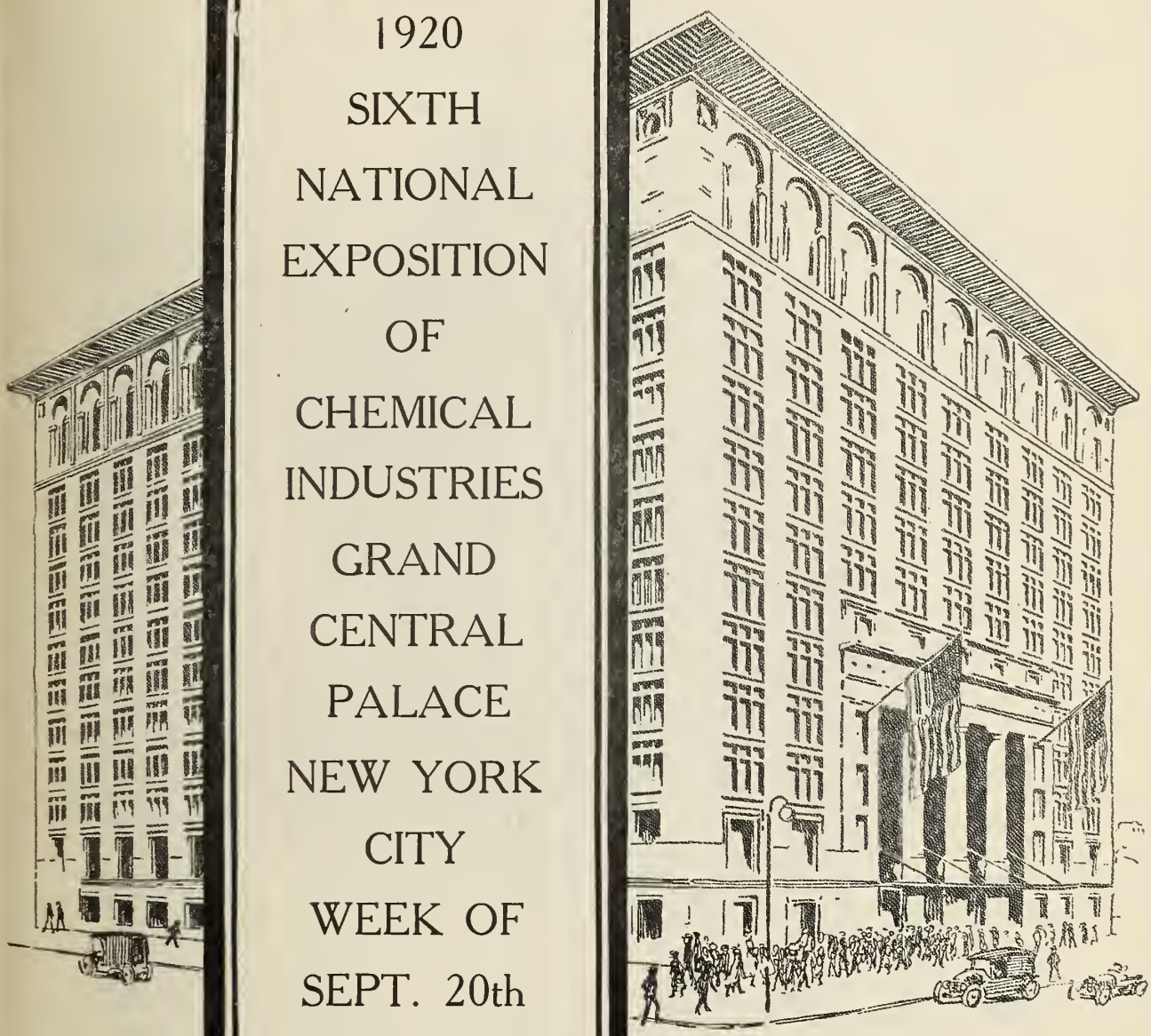

for Industrial Progress

DEVINE

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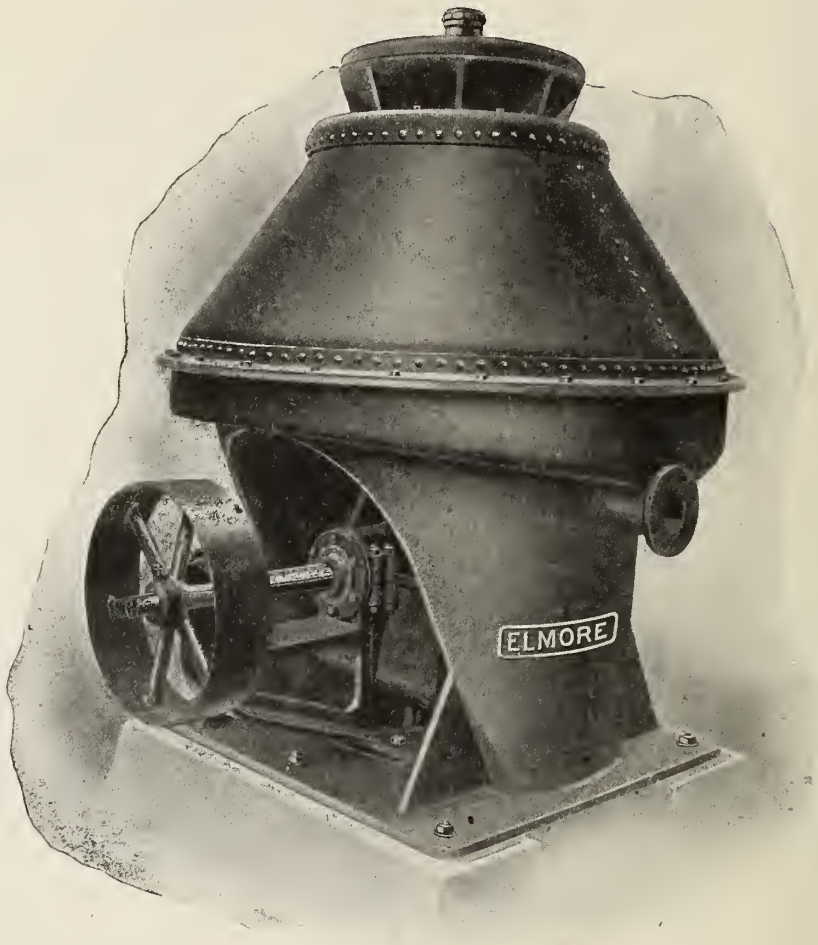

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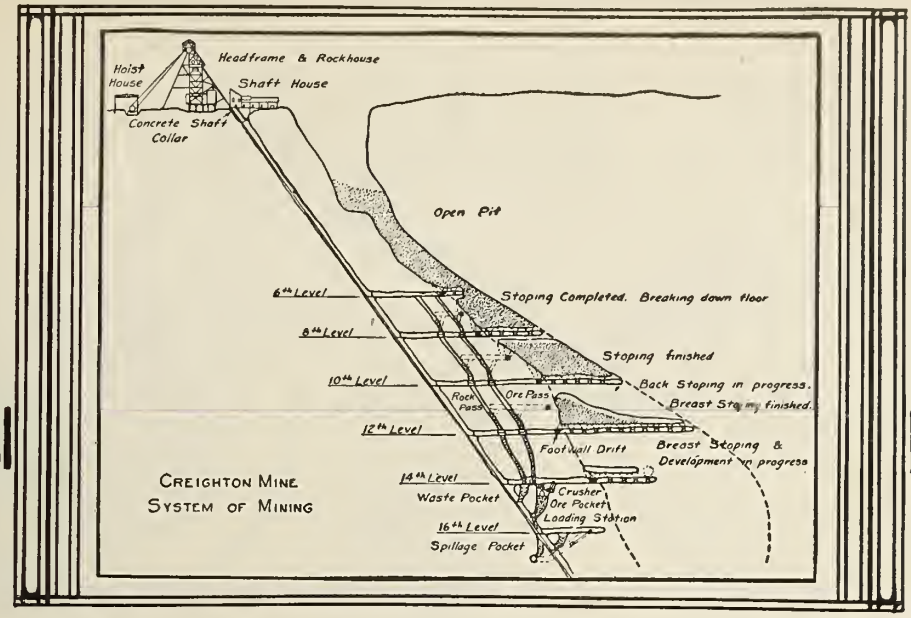

FACTS ABOUT CREIGHTON MINE

THE shaft of Creighton is 1,400 feet deep at an angle of 55°. It is divided into five compartments—two for hoisting ore, two for transportation of men and one for pipes, cables, etc.

The skips have a capacity of seven and a half tons and can be operated at a speed of 2,500 feet a minute, and 5,000 tons of ore can be hoisted daily.

At present there are three main levels equipped with electrically operated trains on 45 lb. steel rails.

Ten miles of steel pipe, varying from 2 inches to 16 inches in diameter, supply compressed air to two hundred rock drills.

The mine is electrically operated and lighted throughout and has a fresh water supply and special ventilating system.

The magnitude of Creighton, and of the equipment and investment that give it the enormous daily production capacity of 5,000 tons of ore, typifies the enterprise that has brought Nickel Service to its present high standard, not only in Canada and Great Britain, but in all parts of the world.

INCO NICKEL

INCO Nickel is sold as shot, high and low carbon; ingots, 25 and 50 lb. sizes; and electrolytic Nickel, 99.80%. Prime metals for the manufacture of Nickel steel, Nickel silver, Anodes, and all remelting purposes.

It is also produced as rods, castings, sheets, strip stock, and wire.

INCO MONEL METAL

The name Monel Metal is given to a line of metal products developed from a natural nickel alloy—67% nickel, 28% copper, and 5% other metals. These products include Monel rods, Monel castings, Monel wire, Monel strip stock, Monel sheets, etc.

Monel Metal withstands alkalies, high temperatures and erosive action of gases and superheated steam and most acids. Can be forged, cast, rolled, drawn, machined, brazed, soldered and welded. Takes and retains a perfect nickel finish.

Monel Metal may solve your difficulties—our Technical and Sales Departments will gladly cooperate with you.

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INCO NICKEL TRADE MARK

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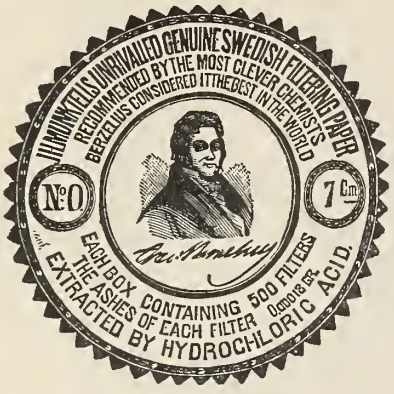
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GRAND CENTRAL PALACE, NEW YORK, WEEK OF SEPTEMBER 20TH.

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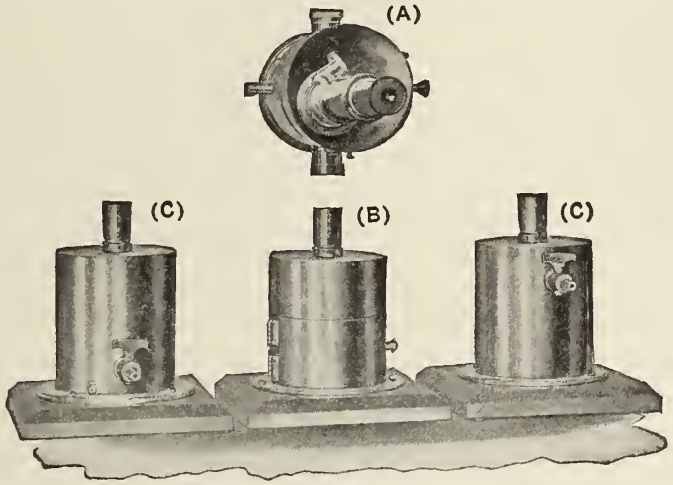
for

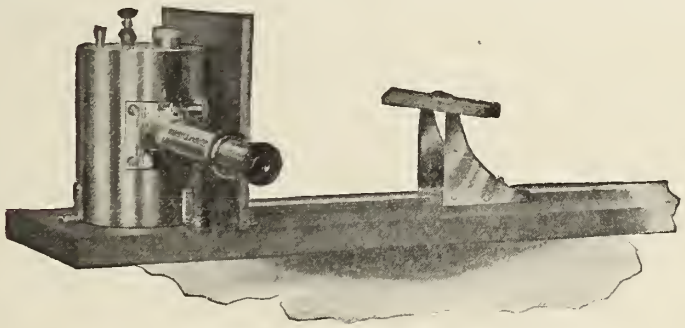
RADIO-ACTIVITY MEASUREMENTS

LIND INTERCHANGEABLE ELECTROSCOPE



Showing Head (A) with Interchangeable Containers

LIND GAMMA RAY ELECTROSCOPE



Showing Track and Holder for Radium Tube

LITERATURE REFERENCES:

Bulletin 104, U.S. Bureau of Mines, Chapt. 5.
H. Schlundt, Trans. Amer. Electrochemical Soc., 26, 163 (1914).
S. C. Lind, J. Ind. and Eng. Chem., May, 1915 (p. 406); Dec., 1915 (p. 1024).
Bulletin 70, U.S. Bureau of Mines (p. 65).
Lind and Whittemore, Tech. 88, U.S. Bureau of Mines; J. Amer. Chem. Soc., 36, 2066.
H. H. Barber, J. Ind. and Eng. Chem., 10, 525.
O. C. Lester, Amer. Jour. Sci., 44, 225.
H. Schlundt and J. E. Underwood, Trans. Amer. Electrochemical Soc., 34.
S. C. Lind, J. Ind. and Eng. Chem., May, 1920 (p. 469).

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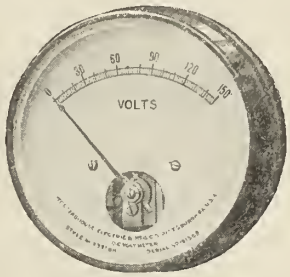

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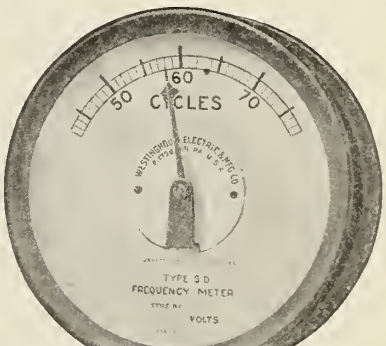

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Tetralene gives the best results when used in conjunction with Soda Soaps.

Tetralene in solution instantly penetrates the goods and dissolves the fatty matters and other impurities chemically. In addition to fats and oils, **Tetralene** acts also upon unsaponifiable matters, such as Tar, Mineral Oil, Paint, Resins, etc., rendering same soluble in the wash water.

Tetralene gives the best results when used in conjunction with Soap of Alkaline solutions and permits of a saving in Soap to the extent of 30 per cent to 50 per cent. Ordinary Soda Soaps only are necessary where **Tetralene** is used in conjunction. Potash is no longer necessary.

Tetralene should always be used where thorough degreasing and purity of fabric are necessary.

Tetralene leaves the goods perfectly odourless and freed from fatty matters, whilst the most delicate colourings are not adversely affected.

Silk and Mercerised Effects come up clearer and brighter and the general quality of the cloth is much improved.

The whole washing, which is finished in about two hours, is better and cheaper than using Ammonia, the colours are spared and no Soap or other residues remain.

Tetralene may be used with safety in practically any proportion, as is the case with Soap, though the amount necessary depends upon the amount of grease, oils, or other impurities contained in, and to be removed from the pieces. This varies from 3 ozs. to 7 ozs. for every 200 lbs. of goods.

NOTE—Tetralene is supplied only in its standard concentrated form:

A Clear Neutral Liquid Product

Guaranteed fully 90% strength.

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1 Grog Body. Structure is open. Will stand severe heating and sudden changes in temperature. May be used next to furnaces. Tough and durable. It is not attacked by acids, but when acid stands in it, is liable to sweat. Will not crack.

2 More Vitrified than No. 1. Tough. Withstands strains and stresses well. Will not crack. Can be exposed to sudden changes in temperature.

3 Vitrified open grog body. Tough. Used in manifolds, tower pipe, base tower tile. Will not sweat or seep.

4 More Vitrified than No. 3 and denser. Grog structure, somewhat open. Used in brick and tile for top tower sections where heat is reduced. withstands Acid excellently and does not sweat or crack.

5 Less grog and finer. Dense body. For conveying pipe and fittings, receivers, montejus, large jars, storage tanks.

6 No grog, and denser than No. 5. For pipe, smaller tanks, receivers. Not suited to sudden changes in temperature.

7 Very close structure. No grog. Clean washed, vitrified body of clay passed through 80-mesh screen. Used in faucets, stop cocks, valves, small containers, pitchers, etc.

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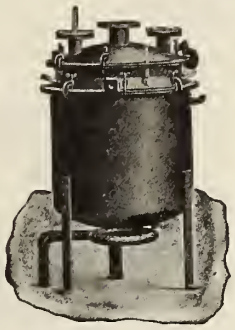
now widely used for the construction of equipment that must resist action of acids



Pfaudler Utility Pot:

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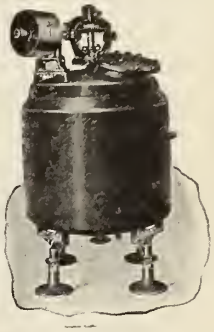

Pfaudler Single Piece Mixer:

Glass Lined Steel. The body of this tank is a single piece of Open Hearth Sheet Steel. The entire interior as well as the agitator is enameled with Pfaudler Glass Enamel. Capacity of tank shown 200 gallons, and is 42 ins. x 36 ins. inside. It may be had in many different sizes and capacities up to 800 gallons.

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Pfaudler Jacketed Evaporating Kettle:

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Pfaudler Jacketed Still:

Glass Lined Steel. Tapering Gooseneck. Jacket and Enameled body of still are welded into one piece: top head bolted on and fitted with sight glasses; manhole cover secured by either swing bolts or through bolts. Tapering enameled gooseneck bolted to welded-on flanged nozzle in head. Flanged or threaded outlet through stuffing box in bottom of jacket. Various sizes and capacities.

Pfaudler Crystallizing Pan:

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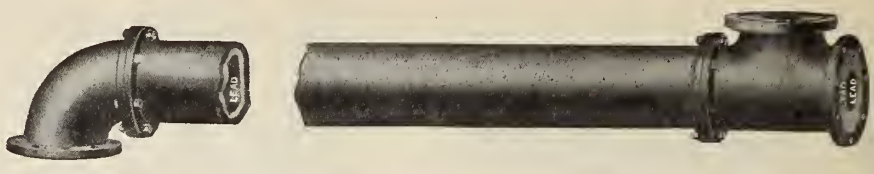
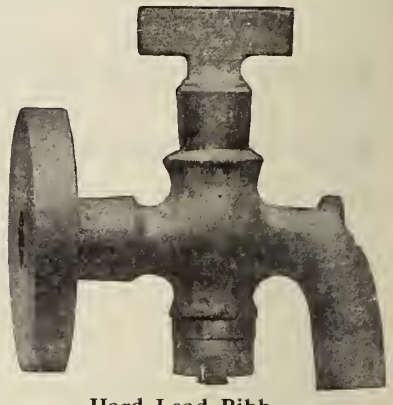


Section Flanged Pipe and Fittings

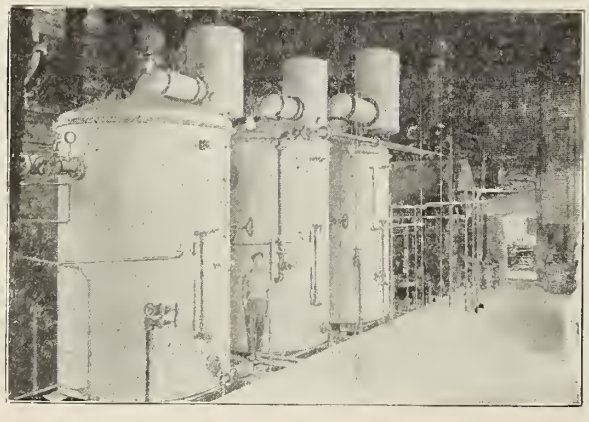
Straight Plug Cock



Hard Lead Bibb

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG



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CANADIAN CHEMICAL JOURNAL

A Canadian Journal devoted to Metallurgy Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 TORONTO, SEPTEMBER, 1920 No. 9

P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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EDITORIALS

THE DEAN.

DOCTOR ELLIS is dead. His pleasant kindliness is henceforth to be a memory, not an experience. For a long time to come there will be a point in the gatherings of Toronto chemists where the lack of a few words from Dr. Ellis will be poignant. His laugh, and the joyous soul of him we shall miss, and the wisdom in his whimsical counsel, none the less deep for the pleasant vein of it.

The harvest of his fruitful life will not soon be garnered, for he gave himself generously in many fields.

AS TO BLOWING OUR OWN HORN.

IN the August Century, in his ably written department, "The Tide of Affairs," Glen Frank has an article headed "Near-sighted Class Journalism."

The article starts with the statement that "The most perilous disease in the world is not leprosy, but lopsidedness," and quotes from a recent article, by Charles Moreau Harger, on "Class Journalism," in the New York "Evening Post," to the effect that the latest list shows that in the United States there are over 4,000 class journals. Harger says: "The dealer in awnings or wall paper, in coal or fish, the horse shoer, philatelist, auctioneer, grocer, banker, farmer, electrical engineer, nurse, garment maker, steel or coal worker, stone cutter, housewife, railway employe, milliner, lawyer, dentist, priest, labor union member, and a hundred other classes have prepared for their business reading publications, well edited, brimful of information concerning their craft—and sometimes tinctured with propaganda that reaches exactly the most fertile field for its germination."

The article proceeds to point out the dangerous possibilities of these journals as arousing class consciousness, and concludes, "Particularly in this matter of general and class journalism it behooves us as editors to bring to our task an intelligent tolerance, a fine justice of judgment, and a catholic sympathy with divergent points of view, and, as readers, always to allow for the specialist's unconscious bias."

The last phrase would indicate that technical journals were in the writer's mind.

Ignoring that oddness of phrase construction, it is not easy to divine how we could reconcile a "fine justice of judgment," and "sympathy with divergent points of view." That's rather like a friend of ours who could not swim, but who carelessly stood with one foot on each of two parallel logs over six feet of water. His sympathy with divergent points of view, landed him—landed is not quite right—half way between those logs and got another man's clothes wet to pull him out.

The class peril point is well raised, however, and there is probably much to be said about it. We don't mind saying that the phrase "class consciousness" has been used until its back is shiny with leaning on prejudice. Class consciousness is to be frowned on when it means envy and hatred, but why shouldn't it mean sense of responsibility, at least that should be the class consciousness of the technical and professional man. All hail, class consciousness! Who wouldn't rather taste the fat and the lean in a good old sliced ham sandwich, than the characterless flavor of the homogeneous minced variety.

It is one of the risks in the sublime principle of the free agency of man, that some of the special press should misuse its influence. We are frank to say that one intention in the establishment of this journal was that it should further the interests of the Canadian chemist, and the Canadian chemical industry. Another intention is that it should enable the chemist and chemical industry to serve the community better by making them vocal in the public interest. This is our band waggon and we believe in bands. We have not trumpeted much in the past and still prefer the woodwind to the brasses.

One band that we belonged to had seven first cornets in a total of fifteen instruments, with no trombones or baritones. It was fine on the high spots, but no good on the level.

We believe that the function of bands is to produce music and rhythm, not noise. Speaking from some knowledge of technical journals—we read fourteen and three of them are weeklies—we are of the opinion that most, if not all, devote their best energies to the accentuation of subjects and the promotion of objects in the general welfare, that would otherwise be neglected to the distinct loss of the community.

THE SIXTH NATIONAL CHEMICAL EXPOSITION, NEW YORK.

THIS annual event is becoming the core around which the chemical industries in America are being built up. Few ideas have taken hold like the Chemical Exposition. While it is known as the National Chemical Exposition, it is, in reality, international in a sense. Canada has had a section of exhibits practically from the start. Grand Central Palace, from September 20th to September 25th will

be in very truth the centre of all chemical interests. In magnitude, the exposition lacks nothing. Over four hundred different exhibits will occupy space, making a new record.

There is probably no greater factor in America today tending to give business men and the public such a realization of the importance of chemical industries. As a course in applied science and chemistry, the opportunity is nearly perfect. After several years' experience, a disappointed visitor has yet to be discovered.

Chemistry in Canada is being influenced by this creation. A body of public opinion in the United States, favorable to the full development of chemical sciences and appreciative of their significance, must have its influence here. This does not signify that Canadians are more lacking in point of vision than their cousins to the South, but it simply points out that an advance in the United States means a similar result made more possible here. Each year, mineral and other resources of the Dominion have been brought to the attention of thousands at this Exposition. The Government of the Province of Ontario and the railways have shown their appreciation of this opportunity. The water powers of Canada have been represented through the Dominion Government. It is certain that more Canadian companies will desire to be represented each year, as they are thus able to obtain national publicity in the American chemical field.

The average visitor need not spend the entire week examining or studying exhibits. A very full program has been arranged, covering a variety of timely topics. Practically every afternoon and evening, as shown by complete program in this issue, papers and addresses by leaders in industry and science are presented. Motion pictures are taking their place in a large way and the general educational features of the week's program are such as would warrant every manufacturing firm in having a representative present.

The Exposition is for those who believe in progress; for those who have faith in their country and its industrial development; for those who see through the ramifications of applied chemistry and physics, the foundations basic to modern industry and the hope of a real solution to the general problem of the material comfort and happiness of mankind.

THE CANADIAN NATIONAL

Exhibition— of course not the C.N.E.—will be discussed and reported in our next issue.

We can only say now that if you were not able to attend it, you failed to observe Canadian chemical history amaking.

THE NIAGARA PENINSULA.

Garden and Workshop.

WE noted briefly in our August issue the fact that an industrial congress was held at Welland, August 2nd, 3rd, and 4th.

The event merited further reference than we were then able to make.

There is in the Niagara Peninsula a combination not often found. Providence has made enormous industrial development possible in the waters of Niagara and has given the population of that peninsula a strip of fertile land famed throughout the world for growing food, fruit and vegetables.

Both of these great blessings have hitherto been used and enjoyed in a more or less haphazard way.

The communities as represented by their municipal councils, boards of trade and chambers of commerce have formed an association to be known as the Niagara District Industrial Association.

It is well that such an association exists for two very good reasons. First, that all possible industrial development be arranged for. Second, that the sources of power and food be protected in the interests of the people. The food producing areas in the neighborhoods of our cities have been cursed with the blight of real estate booms. Orchards, truck farms, and beauty spots have been sacrificed to Moloch, while garden fruit and vegetables have reached a price beyond the purse of many parents whose children are failing from inanition.

There is some assurance that the water powers are being attended to in the public interest. This is so of the greater enterprises of Niagara with International control. We have always felt that there has been more or less neglect of the picturesque "old" Welland Canal, which is now only used for power. The old adage about turning the wheel with the water that is past does not apply here, and the aggregate of the many successive power installations on this old waterway is quite large. There are evidences of much silting up with trade wastes, mud, sewage and slime. Not only is this a peril to power users, but it is a constant source of loss and irritation to the users of this water, especially the pulp and paper manufacturers to whom character of water is of prime importance.

This industrial asset is too valuable to treat thus when indications are that limits will soon be reached in power transmission. Here nature is transmitting power and the construction cost of the carrier has been amortised long since.

The God-given combination of workshop and garden constitutes a trust. The chemical industries of Canada are singularly favored in the possession of two such centers as Shawinigan and Niagara for the more

spectacular branches of metallurgical and electrolytic chemistry.

The fact that one of the large Niagara plants is producing cyanamid and other products from atmospheric nitrogen reminds us of the relation of chemistry to agriculture.

There is even a relation of metallurgical chemistry to agriculture in the necessity for tinned sheet for can making and solders for the cans, paper making, ink, and varnish making, and many other branches of chemistry are interested directly or indirectly.

All these depend in one way or another on transportation. The fruit may rot on the trees or the manufactured product pile up in useless congestion in the warehouses without the means of getting it to market.

Senator Robertson's words at the Welland dinner were significant when he referred to influences at work to overthrow our form of government. That reference recalls the fact that those influences were at work in the yardmen's strike last spring. The fruit men need cans, the can makers need tin plates. the tin plate men need sheet iron, all need coal, and these were tied up by a few radicals in a strike unauthorized by the American Federation of Labor, and results of which are still evident in transport problems.

The Niagara district is well suited to highway transportation with boat connections, so these should be attended to with care as well as the railways. Senator E. D. Smith, of Winona, spoke feelingly to that point.

Lastly, Niagara is one of the great vacation grounds of the continent and foresight on the part of both nations has secured for the enjoyment of all the best of the beauties of nature in parks, free, and laid out with great good taste.

Niagara the workshop, garden and playground of two nations, is a great trust committed to its people.

S.C.I. ANNUAL, 1921.

THE Annual Meeting of the Society of Chemical Industry is to be held next year in Montreal. The invitation of the Canadian Section was unanimously accepted.

This means a great deal of work for the Canadian Executive and naturally a large share of this work will devolve upon Montreal.

If it is found possible to comply with Dr. Herty's suggestion that there be a general reunion or Olympiad of British and American chemists at New York in September, 1921, the Canadian arrangements will no doubt have to be modified in some details.

There should be, in that event, a well-planned itinerary in Canada. The relationship and interdependence of the chemical industries of the Empire emphasize the need for personal knowledge of Canadian resources and men, on the part of chemists from overseas.

The relationships and mutual responsibilities of chemists in the two great federations controlled by Christian and Anglo-Saxon ideals, in a broader sense emphasize the desirability of close co-operation between scientists of the United States and the British Empire.

OIL VS. COAL.

SIGNIFICANT of the tendency to plunge into anything that looks good was the adoption of oil fuel by many large steam users. We have noted recently that a plant with eleven oil-fired boilers developing about 5,000 horse-power and consuming annually 250,000 barrels of oil is to be converted to a coal-burning proposition at an expense of some hundreds of thousands of dollars. The reason given is possibility of serious shortage of oil and possible failure of electric power.

One oil expert recently informed a governmental committee in the United States that it was possible to "crack" oil to such an extent that practically all the crude could be converted into motor fuel. With the increasing demand for gasoline and the large requirements for oil in the navies of the world, it appears to be a bad guess to put up large oil-firing installations. Looks as if the merry old coal were going to be able to call the tune from his fiddlers for some time yet.

PERFECTION AT LAST.

We have been told of a want ad. which opened as follows:

"Academically perfected paper technician. seeks engagement, etc."

We are inclined to believe that he received few replies.

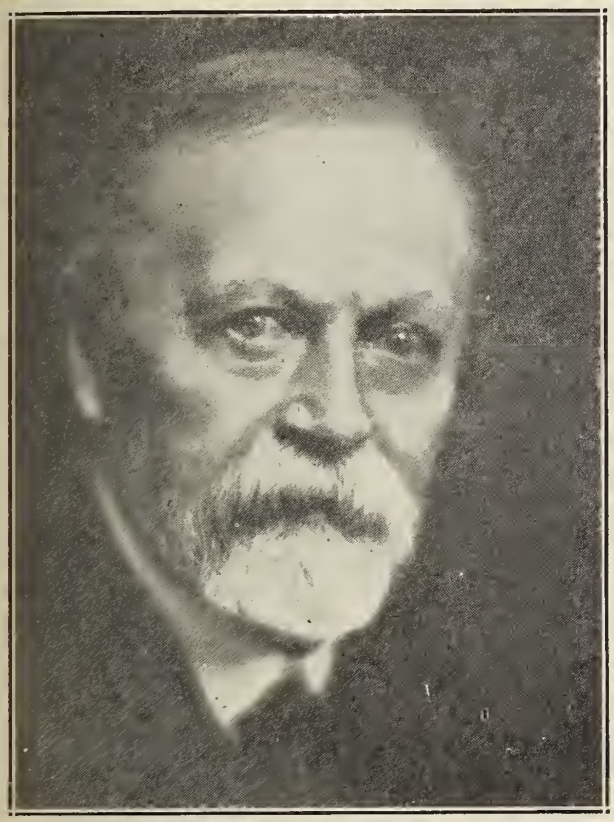
THE ALKALI CONTENT OF SOILS AS RELATED TO CROP GROWTH.

At the last meeting of the Royal Society, Dr. Frank T. Shutt, Dominion Chemist, presented a report of progress on work, undertaken and carried on under his direction by Mr. E. A. Smith, for the purpose of determining to what extent it may be possible to classify certain areas in Southern Alberta into irrigable and non-irrigable lands. The chief feature in the analytical work involved in this investigation was the determination of the so-called alkali, its nature, and amount, on soil samples collected in suspected areas at depths varying up to five feet. The data given are tabulated and arranged in graphical form to show the limits of tolerance of wheat, oats and western rye grass to white and black alkali.

It is proposed to continue the work over a period of years, and consequently no detailed discussion of the data presented is given. It is pointed out that the results presented are in accordance with those presented in the previous paper, and that the work will in time afford a valuable basis for the classification of the alkali-affected areas.

THE PASSING OF DEAN ELLIS.

Seldom, indeed, does death remove one who will be so keenly missed and genuinely deeply regretted as Doctor William Hodgson Ellis, former Dean of the Faculty of Applied Science, Toronto University, who passed away at Lake Joseph, Muskoka, August 23, 1920. Although Dr. Ellis was in his 75th year, and had not for the past year or so been just as active as he or his friends would have



Dr. Hodgson Ellis.

wished, yet his death came as a distinct shock to his colleagues of the University and to a host of graduates throughout Canada.

For over forty years Dr. Ellis had been on the teaching staff of Toronto University. He held various lectureships until the year 1887, when he became Professor of Applied Chemistry at the School of Practical Science. His splendid services to the University finally culminated in his being made Dean of the Faculty of Applied Science, a position from which he retired only a little over a year ago, in May, 1919. He was born at Bakewell, Derbyshire, England, and after coming to Canada became a student at the University of Toronto, attaining the degree of B.A. in 1867, and Master of Arts in the following year. In 1870 he graduated in medicine, and in 1871 became a licentiate of the Royal College of Physicians (England). He was a Fellow of the Institute of Chemistry and a member of the Royal Society of Canada. He was also a member of the Society of Public Analysts of Great Britain. He was twice president of the Royal Canadian Institute. In 1895 he was appointed a Senator of the University of Toronto. The work that Dr. Ellis has done for the University of Toronto and for the advancement of science in Canada cannot be measured.

In the Society of Chemical Industry he was always an active spirit and his advice and counsel will be greatly missed by the members of the Toronto Branch, of which he was president in 1906. During the term 1919-20, he was present at almost every meeting of the local Branch. On April 17, 1919, at the Annual and Reunion Dinner of the Industrial Chemical Club of the Faculty of Applied Science, Toronto University, held at the Carls-Rite Hotel, Dr. Ellis was the honored guest of the evening on the occasion of his retiring from the staff of the University. As Professor Bain said that evening, "Dr. Ellis not only taught men, he made men out of the students who came before him. He had built a noble edifice and the stones of it were the love and admiration of his students." In replying, Dr. Ellis had said that while his students were scattered over the whole world, he would never forget their loyalty.

The late Dr. Ellis was a thorough Canadian and Britisher. At Ridgetown, in 1866, he served his country with the Queen's Own Regiment, for which he possessed the Campaign Medal and Clasp. He possessed a kind, generous, loveable spirit, and was beloved by colleagues and students alike. In 1875 he married Miss Ellen Maud Mickle, of Guelph, Ont., who survives him.

The funeral took place, after a private service at his late residence, Woodlawn Avenue, to St. James Cathedral, Toronto, where many prominent in university and civic life had gathered to pay their last respects to one who was so highly regarded.

FURTHER NOTES ON A CANADIAN OIL SHALE INDUSTRY.

The Editor,
Canadian Chemical Journal,
Toronto, Ont.

My attention has been drawn to "Notes on the Economic Aspects of a Canadian Oil Shale Industry," by S. E. Ells, published in your July number.

The article contains so much that is praiseworthy and to the point that I feel it would be detrimental to the nascent industry were certain misleading and incorrect statements allowed to pass without comment. Seldom have I seen the old saying, "A little knowledge is a dangerous thing," so well illustrated.

Ells quotes figures, which he states are from an estimate made before the war by Craig, of Paisley, Scotland, and which are supposed to be the cost of a "Crude Shale Oil Plant of a throughput of 400,000 tons Scotch Shale per annum" (about 1,200 tons per day), "the works to be erected in Scotland." The total of the figures quoted is £123,975, or, say, about $600,000, and adds that in case of a plant erected in Canada freight charges must be added.

Unfortunately, the items included in Craig's estimate of cost do not include everything necessary to make a completed works, nor does the addition of freight charges alone, constitute the excess of cost, in Canada, over the cost of a works erected in Scotland. For instance, Craig's estimate does not include:—

Power Machinery, i.e., Steam Engines or Turbines with Electric Generators, necessary Power House and Transmission Lines. Nor does it include such necessary buildings as Warehouses and Offices, nor the cost of Storage Tanks, Pipe Lines and Tank Cars. Nor is the cost of Mining Machinery, nor the cost of preparing and opening up the deposit provided for. These several items, so omitted, may, when certain local conditions exist, increase the cost of a completed works to £180,000, or even £200,000, in the latter case, say, $1,000,000, when erected in Scotland.

Besides the cost of freight, admitted by Ells, there has to be provided the cost of packing, forwarding, breakage,

insurance, erection in Canada and, lastly but not least, customs charges. Allowance has also to be made for an extra loss of interest. The total of these charges added to the cost of freight may easily increase the total cost from $1,000,000 to $1,500,000. Verily, "a little knowledge is a dangerous thing."

Ells states that in 1908 a Standard Scotch Retort, with a throughput capacity of 4 tons of Scotch Shale for 24 hours, did not pass through more than 2¼ tons of New Brunswick Shale, and naively adds that too much importance should not be attached to the fact, wherein I beg to differ, for the following reason: If the reduced throughput mentioned is consequent upon the retorting of New Brunswick Shale, then, and in that case, no less than $300,000 may have to be added to the already very large total above mentioned, before a throughput of 1,200 tons per day can be secured.

If the Scotch Retort be not the perfect machine claimed by Ells, and which Ells by his own admission indicates, why does Ells try to boost up the Scotch Retort?

The chemical principles that underly the art of oil shale retorting have been fairly well worked out by the Scotch, but in the economic application of those principles there has been, and still is, much to be desired. Nor must it be forgotten that the Scotch Retort represents the application of those principles under certain local conditions, which differ widely from the conditions that exist in New Brunswick. My views on this point have been made public in articles written for and published in the Chemical and Metallurgical Engineering of New York and are noted by the Mines Bureau of the Department of the Interior at Washington, U.S.A., so I need make no further comment.

Ells' estimate as to the cost of "Open Pit" Mining is as much too high as his estimate of the cost of a Crude oil works constructed after the Scotch system is too low. Properties exist in New Brunswick where millions of tons of shale can be mined by open pit methods at a wages cost of less than 25 cents per ton, as against a cost for Deep Mining of $1.25 before the war, and of $2.50 to-day.

The Refinery losses of all Shale Oils varies not alone with the refinery process used, but also with the Retort Practice. The writer has had New Brunswick crude oil fractionated and refined with a loss of only about 36%, as against the loss quoted by Ells of 56%.

With good retort methods the writer is of opinion that the Shale he was then testing would yield an oil that would, on refining, show losses little in excess of the Scotch.

Seeing that such serious errors exist in the statements made by Ells, his summary and conclusion cannot be accepted.

No one can, with safety, estimate "the probable profits of a Canadian oil industry," unless the local conditions are truly and accurately stated. The operating of one property might be profitable, while that of another might yield no profit.

The writer has examined several of Canada's oil shale properties and has yet to find one case where the conditions were duplications of those existing at other properties.

Shale not only varies in the value of its contents, not only varies in the cost of mining, but location has much to do with its value.

I am, yours truly,

Louis Simpson.

Ottawa, 9th August, 1920.

EARLY ESTABLISHMENT OF RESEARCH BUREAU URGED.

The early establishment in Canada of a National Research Institute is urged upon the executive of the Federal Government at Ottawa by the Honorary Advisory Council for Scientific and Industrial Research. Political events during the past year have caused this important matter to be sidetracked, but the Research Council is now urging action. The report of the Council Chairman, Dr. A. B. Macallum, for 1920, states: "Every year lost in effecting this establishment will increase the difficulties of Canadian industries in competing with industry abroad, which is aided by all the resources that scientific research will place at its command." There are 20 trade associations for research in Great Britain, 30 in the United States, and similar associations to work in conjunction with the Institute will have to be formed here, states the Council, if Canada is to remain abreast of industrial development.

TRAFFIC THROUGH CANADIAN CANALS.

The Transportation Division of the Bureau of Statistics, Ottawa, publishes the following on the traffic which passed through the Canadian Canals during June, 1920.

The total number of vessels through all canals was 4,251, with a net tonnage of 1,768,575 tons, a decrease from June, 1919, of 384,785 tons. Cargoes totalled 1,234,691 tons, a decrease of 295,626 tons.

The main items of cargoes compared with June, 1919, are: Bituminous Coal, 395,261 tons, decrease, 106,244 tons; wheat, 182,998 tons, decrease, 60,318 tons; Iron Ore, 140,608 tons, decrease, 76,015 tons; pulpwood, 110,554 tons, increase, 44,109 tons; anthracite coal, 64,248 tons, increase, 4,076 tons; sand, 80,391 tons, increase, 12,379 tons.

Since the opening of navigation, 1920, the cargoes through the canals are: Bituminous coal, 711,711 tons, decrease, 131,250 tons; anthracite coal, 104,680 tons, decrease, 34,381 tons; iron ore, 384,275 tons, decrease, 1,090,864 tons; pulpwood, 135,793 tons, increase, 47,637 tons; wheat, 436,189 tons, decrease, 325,256 tons; oats, 84,137 tons, increase, 39,175 tons; flour, 64,600 tons, decrease, 51,715 tons.

PAPER PULP FROM PAPYRUS IN SOUTH AFRICA.

Arrangements for the manufacture of paper pulp from papyrus grass in Zululand are now in progress. A Norwegian company (Walmer Papyrus Pulp Co.) has secured a concession over several hundred square miles from which to reap all reeds and papyrus grass, which are considered to be excellent raw materials for the manufacture of paper pulp. The company is capitalized at £160,000 ($779,000). A factory capable of turning out 6,000 tons of pulp a year is now being erected at Umfolosi. Most of the machinery and equipment was obtained in the United States.

The company intends at first only to manufacture paper pulp. It is estimated that it will take fully 40,000 tons of raw material to produce the 6,000 tons of pulp, but as the growth of this grass is perennial, and the area where it is found is so extensive, an abundance of raw material is assured each year. The papyrus has to be cut by hand in the same way as sugar cane. The grass is dried, passed through a cutting machine, and then pressed and limewashed. An abundance of cheap colored labor is available. Later on the company intends to extend its operations to the manufacture of paper, textiles, and bags.—*Canadian Lumberman.*

Recent Developments in the Niagara Peninsula

The Industrial Significance of the Queenston-Chippewa Power Development and the Construction of the New Welland Ship Canal.

Contributed by the Staff.

THE recent Industrial Conference initiated by the allied Boards of Trade and Chambers of Commerce of Cities and municipalities of the Niagara Peninsula gave visitors an opportunity to see the district and its possibilities as a whole. Following three days spent viewing the developments which have taken place or are under way leaves an impression that something rather unique has been observed.

While it is not spoken of as such, a chemical engineer sees here a remarkably combination of industrial activities, based, for the most part, on the direct combination of chemistry and electric power.

The Niagara District first drew to itself those chemical industries that were large users of electricity in their processes, as distinct from industries using power for motor purposes. Developments of such a nature are under way now as would indicate that their completion would mark a new era for the district While there is certain to be a general distribution of power under a public-owned system, those localities nearest the source are naturally in a position to have some advantage in costs and other things being equal are likely to attract a majority of the new industrial plants established.

After viewing the whole situation and comparing it with other districts in the Dominion, the whole peninsula presents such marked shipping and trade route facilities that there need be no fear but that the general development of the Dominion will be reflected in the special development of this district

No district could be represented by a more enthusiastic group of civic officials, and the situation as seen by the Chemical Journal in company with visiting American manufacturers presented something well worthy of the attention of chemcal manufacturers and industries generally.

The Chippewa—Queenston Power Canal.

August 2nd found a party of industrialists as guests of the City of Niagara Falls, and the Queen Victoria Niagara Falls Park Commissioners. The first day was spent looking over established power plants, and viewing the Chippewa-Queenston Power Development. The unique plant of the Ontario Power Co. makes a remarkable impression. Entering the side of the hill, you first descend practically the depth of the gorge at that point, and view the generation at one spot of some 250,000 H.P. To see two men distributing this power all over Western Ontario and a fair portion of New York State, and still having lots of time to talk about it, providing the weather is fair, is something which, although familiar enough, must always be striking.

Leaving what has been done, namely the creation of 450,000 H.P., at Niagara, to observe something even greater now nearing completion, was the next step. The Chippewa River has been tapped 4½ miles from its mouth, just above the Falls. Its course in this length has been inverted, and a rock channel blasted out behind the city, which again meets the River below the rapids and within a mile or less of the Bridge at Queenston. Here may be seen three of the largest electric shovels in the world, capable of handling 8 cubic yards of earth and six cubic yards of rock at each scoop, hoisting massive rocks 60 feet up to dumping cars. These Bucyrus shovels would certainly have gladdened the heart of many a contractor, if he could have placed one on his job when time was short It takes 12000 H.P. to operate canal construction every day. The feature of the rock excavation is the 60 foot blasting, by which the rock is broken up for the shovels. 16 compressors supply 1300 cu. ft. of air at 125 lbs. every minute. The power canal opens into a large fore bay, all blasted from solid rock At the present time construction is beginning on the power plant below the cliff at this point.

The statistics relating to this well-known development are:—

Horse power to be developed	300,000
Capacity of Units	50,000
Diameter of Main Penstocks	13 ft. 6 in.
Gross Head	315 ft.
Net Effective Head	305 ft.
Water Required	10,000 c.f.s.
Length of Canal	12¾ miles
Excavated Canal	8½ miles
Gradient in Ex. canal per mile	1 ft.
Width of Earth Section	162 ft.
Width of Rock Section	48 ft.
Earth Excavation	11,000,000 cu. yds.
Rock Excavation	4,000,000 cu. yds.
Deepest Cut	145 ft.
Estimated Cost	$40,000,000.

No time was spent visiting specific plants at Niagara Falls, other than those developing power. Chemistry in large letters might well be written over the extensive works of the American Cyanimid Co. During the evening, much interesting history and many prophetic statements were contributed at the banquet at the Clifton Hotel. The story of the transformation of the development of hydro power from a private to a public enterprise was told by Mr. W. M. German, K.C. Even now, engineers forsee the time when practically all the water now going over the Falls will be put to power development. Mr. H. G. Acres, chief engineer of the Chippawa development, gave a picture of the completed work of the Hydro-Electric Commission, showing how Ontario would stand when all her available water powers were developed. An extraordinary vision of industrial possibilities was presented.

On the second day, the whole party motored over the Niagara Boulevard, through Bridgeburg and Old Fort Erie, to Crystal Beach, where, during luncheon the general question of transportation was taken up. Nine railway lines traverse the district, and chief points are linked up by radials. The next stop was Port Colborne, where such plants as the Canada Furnace Co., a plant of the Canada

Cement Co., now recovering potash, International Nickel Co., Government Grain elevators, and the Maple Leaf Milling Co., Ltd. are located.

The Welland Ship Canal.

At this point, the Welland Ship Canal begins. The completion of the New Welland Ship Canal will mark the opening of one necessary link to ocean traffic. Its full value will come only when the St. Lawrence has been made open to larger boats. In the meantime, it will greatly stimulate the industrial centres in the district. The first Canal was started in 1824 and the first boats passed through in 1829. Officially, the first Canal was completed in 1833. It had 40 wooden locks and 8 ft. of water. It became the property of the Government of Upper Canada in 1841. The New Canal was completed in 1882 and 14 ft. of water was obtained by raising banks and lock walls. The New Welland Ship Canal enters Lake Erie at Port Weller, three miles east of Port Dalhousie. The entrance piers are 1½ miles from shore in 30 ft of water. There will be 7 locks only in the 25 miles of canal, each with a lift of 46½ ft. Each lock will be 800 ft. long, carrying 30 ft. of water. The Canal will be 200 ft. wide at 25 ft. depth, and 310 ft. at the water line. The valves and culverts are of such dimensions that a lock can be filled in eight minutes. A loaded lake vessel will pass the entire canal in 8 hours, as against 15 hours at present. Some 2,500,000 cu. yards of concrete will be required. It does not take a prophet to see that industries and population will certainly follow the placing of cities and towns on this canal in the position where they may be rated as ocean ports in the centre of a Continent with an assured supply of power cheaply available.

Such is the development upon which the future prosperity of Welland, Port Robinson, Port Colborne, St Catharines, Merritton, Thorold, Port Weller and Port Dalhousie depends. Already industries have found these locations very suitable. Chemical, metallurgical, iron and canning industries are established. The natural agricultural and fruit-growing possibilities of the district ensure a rural population. With Hydro-Electric power at an average of $16 per H.P., the whole district would seem to be about to realize upon its central location in America, there being few manufacturing districts, if any, whose circle of facilities seems so complete

Speaking at Welland, Senator G. Robertson, Minister of Labor, a native of the district, discussed the transportation problems of the Dominion. After viewing the Canal work and some of the paper mills, the three-day program was completed by a dinner at St Catharines, where Senator E. D. Smith, of Winona, discussed the development of the fruit and canning industries in Ontario.

Those who were favored with this view of the Niagara district as it is and will be, more particularly those representatives of American Companies, whose first hand knowledge may have been previously rather slight, are certain to be its best publicity agents in the future.

It may all be summed up by saying that the industrial future of the whole district is axiomatic.

WELL-KNOWN BOTANIST PASSES.

Professor John Macoun, one of the leading botanists of Canada, passed away on July 18, at his home in Sydney, B.C. For many years he was a resident of Ottawa, and in collaboration with his son, the late M. J. Macoun, had analyzed and distinguished some 100,000 specimens of the flora of Canada.

REPORT OF ANNUAL MEETING OF MARITIME CHEMISTS' ASSOCIATION.

The regular annual meeting of this Eastern Association was held at St. John, on August 3rd. Representatives from the provinces of Nova Scotia and New Brunswick were present. A resolution was introduced expressing the bereavement of the Members occasioned by the death during the past year of Dr. E. MacKay, of the Department of Chemistry at Dalhousie University, Halifax. Dr. MacKay was a former President of the Association, and one of the most prominent teachers of chemistry in Eastern Canada. His work in building up the Chemistry Department at Dalhousie will long be a benefit to that institution.

Progress and the spirit of co-operation were in evidence at the meeting. It was decided to form the "Maritime Section of the Society of Chemical Industry," and affiliate directly with the parent Society in London, following the lead of other Canadian Sections. It is proposed to retain the present organization for the accommodation of those who may not wish to join the larger organization. Joint meetings will be held and it is proposed that officers shall serve both organizations.

Papers were presented by Prof. L. C. Harlow, of the N. S. Agricultural College, Truro. An address was given by Dr. H. S. Abramson, of the General Hospital, St. John, on "The Relation of Chemistry to Medicine." An illustrated paper was presented by Dr. H. Jermaine Creighton, of Swarthmore College, Pa., on "How the Nitrogen Problem Has Been Solved."

The meeting next year will be held in Truro, N.S. The following officers were elected. President, Dr. H. L. Bigelow, Sackville, N.S. Vice-Presidents, Dr. H. J. Creighton, Swarthmore, Pa.; I. C. Mackie, Sydney, N.S. Secretary-Treasurer, H. B. Vickery, Armdale P. O., Halifax. General Committee, L. C. Harlow, Truro, N.S.; A. F. Blake, St. John, N.B.

EVAPORATOR COMPANY WINS SUIT.

The Swenson Evaporator Company, of Chicago, Ill., were plaintiffs in a suit brought by them against the Minneapolis and Ontario Paper Co., of International Falls, Minnesota. Late in 1916 the paper company purchased from the evaporator company some of the machinery required for the pulp department, more particularly the reclaiming end of a 75-ton "Kraft" mill. The Evaporator Company filed suit in the United States District Court at Minneapolis for the remaining amount due in accordance with contract, claiming about $40,000 and interest. The paper company claimed that their reason for not paying the balance of the account was that the machinery was not built according to contract, and filed a counter claim for $700,000, which was gradually reduced by court rulings to $92,000, as representing the maximum amount that could be due them in case the jury decided they were entitled to any damages at all. The trial opened on June 7th and lasted three weeks. The testimony proved, according to the verdict, that the troubles of the paper company were due to incompetent management and operation, and not to any faulty design or defects in material as furnished by the evaporator company. It was shown also that the machinery and plant were never given a fair trial and that similar machinery made by the evaporator company was giving excellent service at other pulp mills when operating on similar materials. The case was submitted to the jury on June 25, 1920, and a verdict for the plaintiff for $43,862 returned the next morning.

Chemistry and Engineering*

The Field for Co-operation Between the Chemist and the Engineer. The Effect of this on Industrial Management and Plant Operation.

By T. LINSEY CROSSLEY

THE functions of chemist and engineer are not comparative, but supplementary.

In the industrial applications of chemistry to-day a problem becomes a matter of engineering as soon as it leaves the laboratory, and even before that, its engineering features must be studied. On the other hand, many things that appear to be purely matters of engineering depend for their success on due attention to the chemical composition of the materials used.

It is most apparent in the conduct of large chemical and metallurgical works that chemist and engineer must go hand in hand.

The Teutonic reference has been applied almost *ad nauseam*, but I will take the liberty of quoting from a couple of recent addresses before the London section of the Society of Chemical Industry.[1] on the German Chemical Industry, by Messrs. E. V. Evans and G. S. Walpole, who were enabled to visit the German works in an official capacity:

"Another point of the utmost importance which affects the prosperity of the German industry is doubtless the fact that engineers have found it worth their while to cater for the chemical industry. This, in my opinion, is one of the most important assets possessed by Germany at the present moment. Enamels, acid-resisting cements, filtration materials and alloys, have been studied very carefully by the engineer and chemist in collaboration. The problem before this country at the moment is not only the capture of the organic chemical industry, but the adaptation of engineering to the requirements of the industry.

"In the smaller German chemical works there is also evidence that the chemist is well served by the engineer. . . . Success on those lines depends largely upon the service of good chemical engineers . . . The picture conjured up by German chemical industry to-day is team work in its highest development. Partly as a consequence of this, one notices everywhere the most stringent economy of materials and men, and the most lavish expenditure of capital on plant designed to work with a minimum of attendance. It is as rare to see a man shovelling anything as to see a waste product. . . . It has always appeared strange that the Englishman, who in sport always plays for his side, should in business prefer to play a lone hand, whereas the German, having no sport other than his business, always plays on a highly developed system of combination of interests."

The insistence in many articles and addresses on the German system is not a matter of praise on the part of their authors, but is an endeavor to rouse the nation to the need for tackling its problems in a way sufficient to meet the threatening storm of highly organized competition.

The writer is indebted to Mr. R. O. Wynne Roberts for a copy of the *Times* Engineering supplement of July 28, 1916, containing an article by Prof. Donnan, on the Necessity of Co-operation, from which the following is taken:

"The tremendous development of applied chemistry caused by the grim necessities of war has revealed an appalling want of men trained in the right sort of way for this work. There are two main reasons for this. The great majority of British chemists have been trained at the universities and technical schools in a species of qualitative molecule-juggling which alone is of little practical use when tested in the furnace of the factory, where a quantitative control of every factor, and especially the physical and physico-chemical factors, is the sole condition of success. On the other hand, comparatively few engineers in this country have in the past turned their attention to the design and construction of the special types of apparatus and the special modes of operation used in chemical engineering. . . . How many of our young, well-trained engineers have ever heard in the schools of the scientific principles which control the design of the apparatus used for filtration, evaporation, distillation, crystallization, and desiccation—to mention only a few types? How many of them have the faintest idea how to design a steel furnace, a multiple-effect vacuum evaporator, a ferro silicon furnace, or a liquid air rectifier? . . .

The question then resolves itself somewhat into a discussion of how much chemistry an engineer should know, or how much engineering a chemist should know.

In music it is hardly expected that any man should be a *virtuoso* on more than one instrument, but nearly all find some ability on the piano essential, and it might not be going too far to say that chemistry in its relations to other sciences functions in some ways as the piano to the orchestra.

Co-operation Between Chemist and Engineer.

The technical chemist is expected to be cognizant of the inner workings of a great variety of industries, one day it may be a steam laundry, trouble, the next a problem in embalming fluids. In the wide range of chemical problems the effects of mechanical handling are often the determining factors.

There are cases where plants have been erected by chemists with a smattering of engineering knowledge or by engineers with an inkling of chemistry. In either case there would have been far better results had there been co-operation.

In Canada, until quite recently, the engineer has not sought as freely as we would have wished, the co-operation of the chemist, and this is possibly a factor in the situation to-day, in at least one of our great industries, whereby the financial backing for new mills of that industry has engaged engineering firms outside of Canada for their construction.

In the Century Magazine for March, there is an instalment of Professor Skelton's "Life and Letters of Sir Wilfrid Laurier," which opens with a quotation from Paul Lamarche, to this effect:

"Consult the annals of Canada for the past fifty years at random, and whatever party may be in power, what is it

*Read before Toronto Branch Engineering Institute of Canada, April 8th, 1920.

[1]J.S.C.I., Vol. 39, No. 3, pp. 48R-51R.

you find? The Government is building a railway, buying a railway, selling a railway, or blocking a railway."

It looks as if poor Lamarche's ghost might come back in twenty-five years and add another quarter century to his remark. In that question, however, lies a thought that the Canadian engineers have been so busy on transportation that they have not had opportunity to apply their genius to production. I recall the little verse of Robert Louis Stevenson:

> "The child that is not clean and neat,
> With lots of toys and things to eat;
> He is a naughty child, I'm sure,
> Or else his dear papa is poor,"

and paraphrase it to say that the Canadian engineer who has not had a whack at railways is a naughty engineer I'm sure, and belonged to the wrong party, or else his dear papa had a paucity of pull in the right quarter.

In an article entitled "Lessons for Chemical Engineers in Other Industries" (read at the Savannah meeting of the American Institute of Chemical Engineers, December, 1919, by A. E. Marshall,[2] there are suggestive statements referring to wartime quantity production which are so well put that I again take the liberty of quotation as follows:

"A survey of the latest developments of chemical engineering leaves a sufficient reason for the suggestion that the chemical engineer should broaden his lines of study from the limited one of the purely chemical field to the wider viewpoint of engineering work and operation in other industries which present problems analagous to the manufacture of chemicals. . . . In the past, the average chemical plant has started out as a producer of one or of several standard chemical products, and with the development of the business, new but usually inter-related products have been added to the factory output. Invariably the original design was a complete unit, so that even an increase in the output of the original products necessitated the addition of separate complete units without the possibility of effecting economies through the use of labor-saving devices applicable only to tonnage movements. When extensions through the multiplication of products became necessary, the situation was much worse, as the new additions had to be located externally to the original plant unit, and the conveyance of materials produced in the original plant of the new units in which they were to be utilized was necessarily reduced to primitive forms of transportation. There are few industries to-day other than chemical manufacture which present the anachronism of manual handling the semi-finished product of one operation to its final point of utilization.

A generalization of this nature must of course be qualified by exceptions in the case of plants designed to produce large tonnages of the low-priced chemical staples, or as they are more generally termed, "heavy chemicals." Such factories invariably have labor-saving tonnage movement devices, although they are not always in the forward state of development of the means used in other industries. . . . Some chemical plants built within the last five years will find it difficult to make extensions which permit of a lowered cost of production or even a cost equal to the original plant, for the reasons such as lack of strength in the building structure preventing the employment of monorail cranes or similar mechanism to convey supplies of raw materials from the original storage bins or piles to the new extensions. Time can more profitably be spent in designing the present to suit the future than in trying to add in the future to a completed unit which has no outlets for expansion."

The handling of raw materials for the chemical industry to-day is essentially an engineering problem. One little instance of this noted recently, was the handling of 4,000,000 cases of soya bean oil in one lot from ship to cars at a Pacific port, and perhaps some of us don't know what soya bean oil is. If we followed that oil to its various destinations we would find still more problems in chemistry and engineering. It is used in foodstuffs, soap, paints and varnishes. Paints are to the engineer like the poor, in that he always has them to provide for. The life of great structures like the Quebec bridge depend on the protection of their members from the effects of weather. A special paint was made up for the Quebec bridge and it would be interesting to have some report of its service.

How Much Engineering Should Chemist Know?

Two outstanding feats of chemical engineering bear on the remark as to the amount of engineering knowledge a chemist should have.

One of these was Gayley's accomplishment of the task of removing water from the air used in blast furnaces. The little problem he tackled was the removal of moisture from 40,000 cubic feet of air per minute, and he did it. It took him eighteen years, of which five years was spent in obtaining reliable data as to the moisture content of the air all day and every day for that time. He found that his 40,000 cubic feet of air per minute contained all the way from 73 gallons of water per hour in February, to 237 gallons per hour in June to each furnace.

Fourteen years after starting he asked for $100,000 to make an installation, and when he accepted the Perkin medal, some years later, he said, "Here my most difficult work began, to persuade my associates that air did really carry moisture and that it could appreciably, even in the smallest degree, affect the working of a blast furnace," and even when he offered to pay half the expense himself, it was a year before he got the appropriation. In 1904, after eighteen years, the air drying apparatus was put in, and when two-thirds of the air going to the furnaces was dried, it was found that nine per cent. more ore and flux could be handled with no more fuel, and in six months' time a regular economy of fifteen per cent. was decided upon, while twenty per cent. had been found possible. The outcome of Gayley's work was a saving of about $25,000,000 annually to the American Iron and Steel industry.

When Dr. Frasch, chemist of the Standard Oil Co. (whose process for taking sulphur out of petroleum oils, made the Canadian oil industry and raised the Standard Oil dividends from 7% to 40% on a hundred million capital, and Ohio Oil from 14c to $1.00 per barrel), wanted to do a little work on the side, he took in the underground sulphur deposits of Louisiana. First, he bought the property, that was act of faith number one. Then he drilled a well to the rock with a 10-inch pipe, continued through the sulphur deposit about 200 feet with a 9-inch drill, immersed a 6-inch pipe from the surface to the bottom, and put a 3-inch pipe inside the 6-inch pipe. After taking some precautionary measures the well was ready for the melting, which was water superheated to 335° F. Putting down the well was act of faith number two, and, finally, to get the volume of heat and steam at the 100 lbs. required, twenty 150 h.p. boilers were used. Dr. Frasch notes that this was "experimentation on a ponderous scale." All this was done on faith without any precedent for guidance, relying only

[2]Chemical & Metallurgical Engineering, February 4, 1920, p. 218.

on the fact that sulphur melts at about 250° F. Dr. Frasch says that the mail boy who drove him to the station said, "Well, you pumped sulphur sure, but nobody believed it but the old carpenter, and they say he's half crazy."

Dr. Frasch pumped sulphur so readily out of that well that if he had not been as humane as he was scientific there might have been a social disaster or revolution in Sicily, as he could have undersold the Sicilian sulphur right in Italy.

I have cited these two classic cases to illustrate the great possibilities of chemical engineering. Perhaps these men might be called engineering chemists instead of chemical engineers, but it only shows how little words mean. Now, if we had union principles applied to engineering, it might have been contrary to regulations for those chemists to practice engineering. Even the United Agricultural Engineers of Ontario may clash with local 4-11-44 Farm Assistants, if they are not careful.

Engineering and chemistry are so involved in all cosmic activities that there is scarcely any line of human endeavor that does not call for men who have given special attention to the particular case.

The insurance business might be cited. When the large industries considered that the insurance companies were getting wealthy too rapidly they formed a little organization of their own called the Factory Mutual, the advent of whose demiurgeous officials strikes terror into the hearts of careless mill foremen. This organization now maintains extensive research laboratories with chemists and engineers continually busy on problems connected with the cause and prevention of fires. Every detail of mill construction and operation is considered as having a bearing on this point. While working to reduce fire risk, they have incidentally obtained much valuable information. The study of fungi in mill construction has made one of their engineers, Mr. F. J. Hoxie, an expert whose advice and observations have always been given to the industrial public cheerfully, and without stint, resulting in great savings in replacement and repair.

The engineer family is growing. It used to be just civil and military. Now it is mechanical, electrical, hydraulic, sanitary, chemical and many other "ics" and "als." Soon it will be agricultural, and possibly burial engineers.

I heard a mill manager dictate a letter to his tailor once something like this: "Please build another suit in navy serge, the same as the last one you constructed for me." It is therefore possible that we shall have engineering tailors.

Having referred to sanitary engineers—a very elastic term, by the way—it should be noted that our modern plumbing system was evolved by Dr. Chas. F. Chandler, one of the first great American industrial chemists, as a result of some work he undertook gratuitously for the Metropolitan Board of Health of New York.

Toronto regulations adhere more closely to Chandler's plan than other cities I am familiar with in decreasing a ventilator for every trap, which in the writer's opinion is rather too literal an adherence to Dr. Chandler's system. In a modern, self-contained dwelling, with a well-ventilated trap in the cellar, there should be no necessity to ventilate lavatory, bath or wash tub traps.

Where Chemist and Engineer Could Co-operate.

It might not perhaps be out of place to indicate some of the lines in which engineers and chemists could co-operate.

In the large plants where quantity production is the keynote, the proper routing of materials—a sort of "flow sheet" to use the mining term—can only be arranged by mutual study of the process, properties, quantities and distribution. Each plant, even if handling the same product by the same process has its idiosyncrasies both mechanical and chemical. Many plants which consider it essential to retain a good lawyer and pay heavy fire insurance for years without having resource to either, do not retain chemists or engineers, because they cannot see any defect to remedy. These firms buy new machinery recklessly, the firms selling the machinery send their representatives and the installation is made with no reference to the balancing of conditions. Some mills have equipment in part of the plant for twice the output of some other part, thereby tying up capital and overloading the deficient equipment.

Another point is the need for co-operation between engineers and chemists in the inception of new plants and throughout the consideration of layout. There is a pronounced tendency on the part of interests putting up new plant or extensions, to engage the contractor who erected their previous plant, who makes no corrections from experience or operation, and the frequent result is the perpetuation of unsatisfactory conditions. In the interests of conversation of labor and material it seems advisable that no plant should be erected without co-operation of engineers and chemists, even in cases where processes are either essentially chemical or essentially engineering.

In large structural work, such as bridges, where the life of the structure depends in large measure on its protection from weather, careful field tests of paints should be made in the actual locality, and the shop coats should be specified only after the field coat is decided upon.

In the field of lubrication, there may be interesting developments at any time as we study the relations between molecules and their physical effects. How great a part does viscosity play or the chemical composition of lubricants? We have been accustomed to think that there should be no free, fatty acids in lubricants, as they might tend to corrode the metal. We are now informed that small amounts of free, fatty acids are much more effective than large amounts of the neutral oils, from which they are separated. Roughly, the coefficient of friction is lower with, say, 99% mineral oil and 1% fatty acid than with 40% mineral oil and 60% of the neutral vegetable oil-rape, for instance. These figures are illustrative, not exact.

In this connection, the new, hard lead alloy, composed of lead with small amounts of barium and calcium and known as "Ulco," which was designed to replace antimonial lead in shrapnel, is claimed to be an excellent bearing metal in view of its high melting point, fine structure and low coefficient of friction.

In many chemical works, as in mining, the selection of the right type of filter may be the point at which success or failure is settled.

As an illustration of the importance of comparatively simple things there is the case of flotation in the mineral industry. A recent writer has pointed out that 60,000,000 tons of ore are treated annually by the application of the forces in soap bubbles.[3] My attention has recently been called to a case where complaint was made that a mill effluent caused foaming in the water or a stream and that this foam, becoming frozen, interfered with the generation of power at a plant downstream.

Sometimes the design of a plant is good, but the location and quantity of raw materials is unsatisfactory and

[3]Note in Chem. and Met. Eng., 1920, page 312.

the plant is often idle for lack of them or badly handicapped by variations in quantity or quality of raw materials.

At other times an architect and contractor have been settled upon, but the employment of engineer or chemist has been at their option, and no provision made for them in estimates. In some cases an engineer is appointed, but I cannot recall any large piece of structural work for which a consulting chemist was appointed at the outset.

I believe many cases in which the engineer's advice has been over-ridden by architect and contractor might have been settled in the interests of the owners if the engineer had a fellow-scientist to back him up.

I am painfully aware that these observations lack much in the way of originality, but I trust the points touched upon may serve as a basis for discussion.

Future Prospects for Oil and Gas Production in Ontario

The Extent to which Various Geological Formations have Been Searched for Oil and the Results Obtained.

By M. Y. WILLIAMS*

Introduction.

TO-DAY Canada produces about 0.06% of the world's petroleum, and Ontario produces by far the greater part of this. According to the report of the Mines Branch of the Dept. of Mines on the Mineral Production of Canada for 1918, the total production of petroleum for the Dominion was 304,741 barrels, the greatest since 1910. Of this, Ontario produced 288,692, Alberta 13,040, and New Brunswick 3,009 barrels. The value of the Canadian production for 1919 was $744,677, but the value of the imports of petroleum for the same year was $29,351,196. Under these circumstances it is clear that any increase in production is of great national importance.

Five geological formations in Ontario have produced petroleum in commercial quantities; these are, in order from oldest to youngest, the Trenton, the Medina, the Guelph, the Salina, and the Onondaga (Corniferous). Productivity has been in general in inverse ratio to the relative ages of the formations; thus the Onondaga was the earliest developed and has been the steadiest producer and the most uniformly productive formation in Ontario. In fact, it is this formation which has been mainly responsible for placing Ontario "on the map" as a petroleum producer. The oil of Petrolia, Oil Springs, Bothwell, Dutton, Mosa and many smaller fields, is derived from the Onondaga limestone or the sandstone at its base. The long life of these fields has been the wonder of the petroleum geologist, some wells having produced commercial quantities of oil almost continuously for 50 years.

The lower beds of the Salina formation are dolomite and so similar to the upper beds of the Guelph formation upon which they lie, that it is difficult to determine where the boundary should be drawn. It is probable, however, that the lower part of the Salina contains the oil horizon of Pelee Island and of Mersea township. The oil horizon in the Tilbury field is near the contact of the Salina and Guelph formations, but the gas of the Tilbury field has clearly been derived from the Salina formation.

The Guelph formation has probably furnished a part of the oil of the Tilbury field, and appears to have produced all the oil of the Wheatley field.

The Medina, although a good gas horizon, especially in the Niagara Peninsula, produced petroleum in commercial quantities at one locality only, that is, in the Onondaga field near Brantford.

The Trenton formation, notwithstanding its production in Ohio, has, until the last three years, been very disappointing in Ontario. The tempting oil showings of the Manitoulin Island, which caused considerable activity in the sixties, in the nineties, and again in 1912 and 1913, were struck in the top of the Trenton formation. Some oil has been found in this formation, also, near Milton, and oil shows have been reported from it at various other localities. The Dover field, however, is the only one in Ontario from which commercial quantities of oil have been obtained from the Trenton. In this field the top of the Trenton lies on an average about 2,900 feet from the surface, and the oil and the gas which accompany it occur at varying depths between 120 and 290 feet in the formation. As already shown by the writer, as a result of the almost complete absence of water in the formation, the oil is found in a basin or syncline. In Ohio, the Trenton is as in Ontario, a close grained limestone, with beds of crystalline magnesium limestone and dolomite through it. It is in these beds that the oil and gas occur in company with salt water. Without the concentrating influence of water, the accumulation of the fluids of lighter specific gravity is slow and imperfect.

Future Prospects in Southwestern Ontario.

The unexplored, or imperfectly explored, areas underlain by formations which are likely to contain oil or gas, will be considered in order beginning with the youngest and best known.

The Onondaga limestone has sufficient cover to retain oil and gas in Kent, Lambton and the western part of Middlesex and Elgin counties. Elsewhere the drift rests directly on the eroded surface of the Delaware or even the Onondaga limestone, and any oil contained in the formation has escaped. A little oil has been found in Essex county, at Belle River, but this occurrence is the exception. Within the region of its probably productivity, the Onondaga limestone has been penetrated by thousands of wells, as not only those drilled into it to test its possibilities, but also wells drilled to test deeper formations have passed through it. Under these circumstances, it is scarcely likely that any very large oil pools have been overlooked. The opening up of the Mosa field, in 1917, after drilling had been done all around it, should, however, make us careful about drawing general conclusions. The writer has drawn attention, during his work on the Ontario oil fields, to some localities that would stand further prospecting. Some of these have already been drilled and found to be of little value. Others are encouraging, and some production is expected from them. (The account of these is to be found in the Summary Reports of the Geological Survey).

The Salina formation, as already stated, has produced considerable oil and gas. This formation has plenty of cover west and south of a line joining Southampton, Har-

*Paper read by Dr. M. Y. Williams, of the Dominion Geological Survey, at meeting of Canadian Mining Institute, Toronto, March 9, 1920.

riston, Stratford, Woodstock and Buffalo, but can be best prospected along with the underlying Guelph formation, from which it can be differentiated with difficulty. On Pelee Island, however, there is sufficient evidence of an accumulation of oil to encourage prospecting the Salina.

The Guelph dolomite, or the upper part of what is known to drillers as the white lime, is overlain by the Salina dolomites and shales and has sufficient cover to retain oil, west and south of a line joining Southampton, Mount Forest, Kitchener, Brantford and Welland. Away from the vicinity of the oil and gas fields, the Guelph formation has been very imperfectly explored. Except where large accumulations of salt or gypsum occur, the Guelph is approximately parallel to the overlying formations, and so suitable structure may be worked out either from surface exposures or from the information derived from previous drilling. Where salt is found in thick lenses, the underlying formation is likely to be depressed, and so the salt regions have generally proven to be less favorable for oil and gas in the lower formations than the areas where the salt is either thin or absent altogether.

The Medina formation of the Niagara Peninsula has been generally gas-bearing, but a few occurrences of oil are reported from it. The one near Brantford appears as an exception and judging from the knowledge obtained from the deep drilling in the western part of the province, the Medina is not to be considered as a promising oil producing horizon in Ontario.

The Trenton formation, as already stated, has been one of the best oil producing formations in Ohio, and is producing oil at present in Western Kent county, besides containing small quantities of oil on the Manitoulin Island and elsewhere, as shown by previous drilling. In the cases of the small showing of oil, the accumulations were found a few feet below the black shale beds of the Utica, which rest upon the Trenton limestone. The areas where the Trenton may be prospected with hope of success are limited to those regions where the Utica is present in whole or in part, that is, from the outcrop of the Utica westward. A somewhat sinuous line connecting Port Hope with the foot of the escarpment west of Collingwood, forms the approximate eastern boundary of the Utica, and the area to the west may be considered as available for prospecting the Trenton. The eastern part of Ontario, lying between Brockville and Ottawa, is in part underlain by the Trenton formation, which in the vicinity of Ottawa is overlain by the Utica shale. This area, however, has not proved productive of either oil or gas in commercial quantities, one reason probably being that where covered by the Utica the formation is so faulted as to have lost what oil or gas it once contained. Gas in small quantities is commonly reported from this region, however, and considerable drilling has been done.

Oil Prospects on Manitoulin Island.

Manitoulin Island may safely be considered by itself, as there the conditions are in some respects favorable for large accumulations of oil. All but a narrow strip along the northern side of the Island is underlain by Trenton limestone, which outcrops at the surface at many places near its northern boundary. It is probably nowhere more than 900 or 1,000 feet below the surface, even on the south side of the Island.

Early writers called attention to the series of anticlines and synclines, suggested by the physiography of Manitoulin Island, and although these are not as well ascertained as some maps have depicted them to be, decided structural features are known to occur. Considerable quantities of oil were struck near Wekwemikong, Gore Bay, and Sheguiandah, and this oil appears in all cases to have been accompanied by water. The writer has not been able to learn whether the water was normal brine, such as usually accompanies oil, or whether it was sulphur water. In either case, it appears possible that the water entered the formation from the outcrop, dissolving salt and other substances from the beds through which it flowed. This seems more probable, as the Trenton is nearly dry elsewhere in Ontario.

The drilling already done on the Island has been limited almost entirely to the north side, notably near Wekwemikong, Manitowaning, Sheguiandah and Gore Bay. These locations are all but a short distance from the outcrop of the formation beneath the water of the North Channel. Under such conditions the oil accumulations may scarcely be considered as normal. The south and middle portions of the Island have never been drilled, although there is one unfinished well located at Providence Bay. The southern part of the Island is sufficiently far from the out crop of the Trenton to provide against loss of oil or undue interference from water entering the outcrop of the beds. Until drilling is done in the untested portions of the Island, the possibilities of the region can scarcely be said to be known.

The James Bay Slope.

As the older parts of the Province have been more and more prospected, attention has been drawn to other less known fields, and the large areas of Palaeozoic limestones, shales and sandstones lying to the south and west of James and Hudson Bays have naturally attracted attention. The writer made a trip into this basin in the summer of 1919 in order to study the oil possibilities. He followed the Mattagami and the Moose Rivers down to Moose Factory and returned by the Moose and Abitibi Rivers.

This examination shows that of the formations which are likely to contain oil, the Onondaga limestone and the Salina shales outcrop south of James Bay. Previous work done to the east suggests that the Guelph and Trenton formations probably underline the outcropping formations. The Onondaga limestone is covered by Hamilton clay shale and by the Ohio petroleum bearing shales at some localities, but the shale areas are small, and unless larger areas of shale are found, it is hardly likely that the Onondaga will prove to have retained any oil accumulations of importance The structure exposed in the Salina shale on the islands of the Moose River is favorable for oil, both in the Salina and in the underlying formations. The centre of the Onondaga outcrops is west of Moose River, between it and the Albany River, and it is probable that the sedimentary deposits are deepest near the centre of the basin. Somewhere in this central region, test holes will solve some of the problems relating to oil occurence, even if oil is not found. The thickness of the deposits and the kind of formations present would be discovered by the first well sunk to the "granite". With each additional well, more territory would be prospected, and with the necessary levelling and examination of samples, the structure of the area tested could be worked out, new wells being located on the evidence of the knowledge obtained. Until drilling is done, the Palaeozoic basin of James and Hud-

son Bays will be an interesting but unproven area where petroleum may yet be found.

Oil Shales.

With the growing scarcity of oil and its rising cost, oil shale is being more and more looked upon as containing a reserve supply. The Ohio shales, which contain oil in southern Ontario and elsewhere, outcrop on the Mattagami River, just north of Speight's base line and along the Long rapids of the Abitibi River. The outcrops on the Mattagami River are of limited extent, but fossil evidence would suggest that the beds outcropping are near the top of the shales, and in that case the shales may be of considerable thickness, and of greater extent than might otherwise be supposed. The outcrops along the Abitibi River occur as a syncline about 1½ miles wide, near the upper end of the Long rapids, and as north-dipping beds about ½ mile wide, near the foot of the rapids. The total thickness of the beds represented is estimated as not more than 100 feet. Small samples of reasonably fresh shale taken from the outcrop, upon analysis by the Fuel Testing Laboratory of the Mines Branch of the Department of Mines, show a variation of 3.9 to 5.5 per cent. of crude petroleum content. The samples were not large enough to make distillations tests, nor was the specific gravity of the oil ascertained, but assuming the specific gravity to be 0.86, the production would vary per ton of 2,000 pounds from 9 to 13 gallons in round numbers. Previous tests by the Fuel Testing Laboratory on the Ohio shales of Kettle point, Ontario, indicate a yield of 10 gallons of petroleum per long ton of shale, and 15 samples of New Brunswick oil shales give an average of 48 gallons of oil per long ton of shale. Under these circumstances, it is clear that the oil shales of the James Bay region will not stand working under present prices and conditions of transportation.

AMENDMENTS TO INLAND REVENUE ACT REGARDING ALCOHOL.

Important changes have been made to the Inland Revenue Act of Canada, especially regarding alcohol for industrial purposes. These were referred to in our August issue, and for reference we now give the exact text of the more important paragraphs of part I. of the Act relating to alcohol as they now stand on the Statutes:—

Section 368. (a) "'Denatured Alcohol' means alcohol in suitable admixture with such denaturants as to render it, in the judgment of the Minister (of Customs), non-potable and to prevent the recovery of ethyl alcohol."

(b) "'Specially denatured alcohol' means alcohol in suitable admixture with such special denaturants as have been approved by the Minister."

Section 369. (c) "Denatured alcohol and specially denatured alcohol as defined in the next preceding section, which is intended for use in the arts or industries, or for fuel, light, or power, or for any mechanical purpose, may be manufactured in Canada free from excise duty."

Section 370. (d) "Excepting as provided by this Act, no alcohol shall be manufactured, denatured, or recovered in Canada except in distilleries thereto licensed."

Section 371. (1) Denatured alcohol shall be sold, delivered and transported without restriction to dealers, manufacturers and other persons.

(2) Specially denatured alcohol shall only be sold or delivered under a departmental permit to dealers and manufacturers, to be used in the arts and industries in cases where denatured alcohol would be unsuitable, and shall only be moved or transported under such conditions as the Minister may by regulations prescribe.

(3) No alcohol shall be manufactured or sold under the provisions of this part for beverage purposes.

Section 372 declares that the recovery of alcohol after it has been used for industrial purposes shall only be done on the premises in which the alcohol was used, or at a duly licensed distillery, and when recovered on the premises aforesaid must be used in the same establishment.

Section 373 declares that all vessels containing wood alcohol or denatured alcohol shall bear a label bearing the words "Methyl-Hydrate—Poison"

It will be noticed that the amendments remove many of the restrictions that hitherto obtained.

Section 370 hands over the manufacturing of denatured alcohol to the distilleries, which is an advanced step, as hitherto the denaturant was added at the Department of Inland Revenue's methylating plant at Ottawa.

Superintendents of hospitals and physicians are regretting that the Act was not amended so as to permit the use of pure ethyl alcohol for medicinal purposes in hospitals without any restrictions. As it is, hospitals are forced to use methylated alcohol for massage purposes, and this is not only not nearly so beneficial, but very often harmful to the skin.

SACCHARINE AND ITS USES.

Sir Jesse Boot on Its Value as a Condiment.

Due to the sugar shortage which prevailed during this summer, saccharine has attracted increased attention. During the early part of the summer there appeared in many newspapers a despatch from Vienna dealing with sugar and saccharine, and their use as dietetics, stating that the use of the latter resulted in injurious effects to the human system. Sir Jesse Boot took occasion to reply to the statements made in the Vienna despatch by writing his views on the matter to the "London Daily Chronicle," June 7, 1920.

In his reply Sir Jesse Boot has this to say:—

Sugar and saccharine, while both exhibiting the property of sweetness, belong really to entirely different categories in dietetics. Sugar is, properly used, a valued foodstuff. Saccharine is not, in any sense of the word, a foodstuff; it is a condiment, comparable in its uses to pepper, mustard, etc.

For more than 30 years my firm has been selling saccharine. During the war, at the urgent request of the Government, we started its manufacture on a large scale, and have since continued it. During all these years we have supplied many millions of people, and we are at present sending out millions of tablets weekly in addition to the saccharine manufactured for the home market and for export to all parts of the world.

Among the countless number of those who have used this article, we have never heard of one case of untoward results from its use. Used in the proper moderate quantity as a sweetener and not as a food, it is innocuous.

For a generation interested parties and Governments (precisely as was the case with cane sugar when it was first introduced) have sought to prove that saccharine is inimical to health; in no authentic case has this been done.

By-Laws of Canadian Institute of Chemistry*

Revised Statement as Adopted at the Annual Meeting in May, 1920

That the Objects of the Institute be:—

"A"—To raise the Profession of Chemistry to its proper position amongst the other learned Professions, so that it may attract a larger proportion of the best intellects and thereby secure a supply of trained Chemists adequate to the growing industrial and professional needs of the country.

"B"—To form an organization immediately available for consultation by the Government.

"C"—To protect the public by gathering together a body of men who may be consulted with confidence.

"D"—To look after the professional well being of the Chemists by:

1. Having a Registration Bureau.
2. Having social centres.
3. Maintaining an Employment Bureau for Chemists and employers of Chemists.
4. Having centres for the interchange of scientific experience, by both papers and lectures.
5. Maintaining a clearing house of available chemical knowledge, including a library and suitable register that would enable the Central Bureau to put one Chemist in touch with that other Chemist, who might be able to assist him in his particular problems (leaving it to the parties interested to arrange details as to recompense or otherwise).

"E"—To maintain a professional association for professional men.

Membership.

The membership shall consist of two classes, Fellows and Associates of either sex, the former having the right to use the letters F.C.I.C. and the latter having the right to use the letters A.C.I.C.

That the following be the requirements for Fellows:—

(a) One who shall be of the age of twenty-five or over, being a graduate of a recognized University, having a four-year course in Chemistry or Science, and who can satisfy the Council that Chemistry, Pure or Applied, has been his major subject, and who has been actively engaged in the pursuit of Chemistry in a RESPONSIBLE CAPACITY for two additional years.

(b) One who shall be of the age of twenty-five or over, being a graduate of a recognized University, giving a three year course in Chemistry or Science, who can satisfy the Council that Chemistry, Pure or Applied, has been his major subject, and who has taken another year's training in Chemistry, at a University, and who has had in addition, two years experience in Chemistry in a RESPONSIBLE CAPACITY in a laboratory approved by the Council, or under the direction of a Fellow of the Institute. If the additional year at a recognized University is not taken, then three years training in a responsible capacity in a laboratory approved by the Council.

(c) Those who do not qualify under (a) or (b) being of the age of twenty-five or over, shall have held a position of responsibility in Pure or Applied Chemistry for not less than five years and shall be examined by a Board appointed by the Council. The Candidates shall be examined on the theory and practice of Chemistry in which they have been engaged. This examination may be waived at the discretion of the Council if the Candidate was engaged in Chemistry at the date of the inauguration of the Institute, and has held a position of professional responsibility for not less than eight years. Each Candidate shall submit evidence to satisfy the Board that the Candidate has a good general education.

"That the following be the requirements for Associates:—

Persons of any age who would otherwise be eligible for membership as Fellows under provisions (a), (b) and (c), the requirements under (a) and (b) regarding the practice of Chemistry in a responsible capacity being waived.

"An Associate may become a Fellow providing he is recommended by three Fellows and has been engaged for at least two years in the practice of Chemistry, pure or applied, and is otherwise eligible as a Fellow.

"An Associate upon election to a Fellowship shall pay the difference between the initiation fee for Fellows and Associates.

"The Council shall have the right to refuse admission to any applicant, or to remove any member for sufficient cause."

Fees.

The entrance fee for Fellows be Ten Dollars and Annual Fee Ten Dollars.

The Entrance Fee for Associates be Five Dollars and the Annual Fee Five Dollars.

All Fees payable in advance.

All subscriptions shall be considered due January first each year. Any applicant whose form is received at the Secretary-Treasurer's Office after July first, shall pay only half fees for that year, the initiation fee being paid in full as usual. Fees entitle the member to free copies of the official organ of the Institute.

Officers and Council.

The Officers of the Institute shall consist of President, three Vice-Presidents, and a Secretary-Treasurer, who shall be Fellows of the Institute.

The officers shall be elected by the Council from among its own number. The President and Vice-Presidents shall be eligible for another period of one year and no longer.

The council shall consist of the officers and ten other Fellows.

Representation on the Council shall be given to each Province as follows:—

British Columbia	1
Manitoba	1
Alberta	1
Saskatchewan	1
Ontario	5
Quebec	4
Nova Scotia	1
New Brunswick and Prince Edward Island	1
	15

providing, however, that commencing in 1925, the Council shall consist of fifteen members elected from the eight

*Approved by the Annual Meeting of the Institute held at Toronto, May 28th, 1920.

Provinces of the Dominion in proportion to the number of members which each province has upon the roll of the Institute at that time. Each Province shall, however, have at least one member, and for purposes of elections Prince Edward Island and New Brunswick shall be considered as one. A redistribution of the number of representatives shall be made every five years thereafter upon the same basis.

At least one of the representatives from Quebec shall be a French-Canadian.

From the Council five members shall retire annually, and these shall not be eligible for re-election until the expiration of one year. Of the five members of Council that retire each year, three shall be from the Provinces of Ontario and Quebec together and two from the remaining Provinces. For the year 1920 the five members of Council receiving the highest votes shall serve three years, the five members receiving the next highest votes shall serve for two years, and the remaining five members for one year. Subsequently five members of Council shall be elected annually to serve for a period of three years. In the event of a vacancy occurring in the Council it shall be filled by an appointee of the Council, a vote of two-thirds majority being required.

A Nomination Committee to be appointed by the Council at the time of the Annual Meeting shall nominate candidates for election to the Council, the number of names on the Nomination Form to be at least twice the number of vacancies to be filled, in the constituency in which the vacancy occurs.

These nominations shall be mailed by the Secretary before March 1st to each member of the Institute, who shall have the privilege of adding any name or names which he may desire.

After the return of the Nomination Forms to the Secretary, the latter shall mail a ballot to each member not later than April 1st, in the usual manner. Ballots must be returned to the Secretary on or before May 1st, and two other Fellows residing in the same city as the Secretary shall be appointed by the Council to act as Scrutineers.

Management.

The affairs of the Institute shall be managed by the Council, and the last two immediate Past Presidents, who shall continue to be members and who shall be called Honorary Councillors. The Council shall direct the investment and care of the funds of the Institute; shall make appropriations for specific purposes; shall direct the business of the Institute, either itself or through its officials and committees. The Council shall make a report at each Annual Meeting.

Any questions arising shall be communicated in writing to the Secretary-Treasurer, who shall refer the same to the President, who, if he considers it advisable or necessary, shall instruct the Secretary-Treasurer to put the question before each member of Council. An interval of three weeks from the date of mailing shall be allowed, at the end of which time the Secretary-Treasurer shall report to the President as to the replies received. If a majority are at this time in favor of the lines of action suggested, the same shall be acted upon.

In the event of the President not deeming it necessary to refer the point at issue to the Council, he shall instruct the Secretary-Treasurer to proceed.

At the discretion of the President, or upon the request of two members of Council (given in writing) the views of the various members of Council, upon any matters of special importance, shall be circulated among the members, after which they may be requested to vote. Members of Council shall be notified by the Secretary as to the result of the vote.

A letter ballot may be taken at any time, at the discretion of the Council.

Secretary-Treasurer.

The Secretary-Treasurer shall be subject to removal by an affirmative vote of a majority of the members of council. He shall be the executive official of the Institute under the direction of the President, and of the Council. He shall attend all meetings of the Institute and of the Council at the expense of the Institute. He shall present the business therefor, and record the proceedings thereof. He shall see that all moneys due the Institute are carefully collected and banked in the name of the Institute. He shall, with the approval of the Council, employ such help as may be necessary, and shall be responsible for all the Secretarial duties of the Institute. He shall draw cheques against the funds of the Institute, to be countersigned by the President.

The rule referring to ineligibility for re-election of members of Council shall not apply to the Secretary-Treasurer.

The Treasurer shall make a report to Council at the end of each quarter, stating what business has been transacted, what expense has been incurred, what funds received, what applications received, and what the financial standing is at that date.

Employment Bureau.

The Secretary shall keep a register of all Chemists desiring to be listed, with reference to their qualifications, etc., and another register of all persons and companies desiring to use the Institute as a means of securing professional Chemists.

Meetings.

The Annual Meeting shall be held at a place and at a time to be decided by the Council, and a meeting of the Council shall be held on the day previous to the Annual Meeting.

Additional meetings of the Council may be called by the Secretary after consultation with the President, if thought desirable.

Due notice and agenda of the Annual Meeting shall be mailed by the Secretary to all members as of date April 15th, not less than one month previous.

The business shall consist of:—

Presentation of Annual Reports, and Reports of Committees.
Reports of scrutineers on election of Councillors.
Appointment of Auditors for the ensuing year.
Addresses and Papers.
New Business, of which notice in writing must be received by the Secretary not less than two weeks prior to the Annual Meeting.

A Chairman may be appointed by the vote of Fellows of any particular district, who shall arrange meetings of the Fellows and Associates of that district. The object of the meetings shall be to foster the interchange of chemical though, and to enable the Chemists of the district to become better acquainted with each other. Minutes of such meetings shall be sent to the Secretary.

Committees.

The President shall have power to appoint special committees as may be deemed necessary from time to time, either from amongst the members of Council, or from the

Institute generally. The President and Secretary-Treasurer shall be ex-officio members of all Committees.

Examining Board.

A Committee, known as the Examining Board, with power to add to its number, shall be appointed by Council from its members. This Committee shall deal with all applications for admission to the Institute and hold examinations when necessary.

Examination Fees.

The fee from each candidate for each examination as a whole, shall be twenty-five dollars.

Resignations.

Any member desiring to resign from the Institute, shall do so in writing to the Secretary-Treasurer and shall be responsible for the payment of the dues of the year in which his resignation is sent in. The Council shall have power to make special provision for special cases.

Notices.

Any notices shall be deemed to have been properly delivered when mailed to the address of the member as recorded on the register.

Limitation of Members.

The admission to membership in the Institute shall be so regulated that at no time shall the number of members, who are not British subjects, exceed ten per cent. of the active membership of the Institute.

Members in Good Standing.

No member shall be considered in good standing, or as an active member whose dues are over three months in arrears. A member who has lapsed in his payment of dues may be reinstated at the discretion of the Council, by applying in writing to the Secretarc-Treasurer accompanying the letter with the necessary funds to cover the arrears.

A member who is one year in arrears, shall have his name removed as a member of the Institute, though he may be reinstated at the discretion of the Council, by payment of his arrears.

Publications.

(a) The official organ of the Institute shall be the "Canadian Chemical Journal."

(b) The Secretary shall prepare reviews of the activities of the Institute for publication in the official organ of the Institute.

Amendments to By-Laws.

Amendments to the By-Laws shall be presented at the Annual Meeting, and after discussion submitted for letter ballot, in due course. A majority of two-thirds of the recorded vote shall be required for ratification, not less than thirty votes to be recorded.

AMERICAN DYE-STUFF REPORTER EXPANDS.

Congratulations are due the management of the "American Dye-Stuff Reporter" on the issuing of their new monthly technical supplement devoted to the use and application of dye-stuffs and the mechanical equipment incidental thereto. The "Reporter" will continue in its weekly form, the technical supplement being issued every month. Valuable technical articles will appear in the monthly, while the weekly will continue to publish news of the trade in general. The first issue of the supplement contains excellent material and we are assured that a high standard will be maintained.

CANADIAN INSTITUTE OF CHEMISTRY.

Report of Scrutineers on Ballot for Election of Council, August 2nd, 1920.

To the membership of the Canadian Institute of Chemistry:

Dear Sirs,—We have to-night carefully counted and checked the 120 ballots received up to July 31st, with the following results:

British Columbia—J. A. McDonald Dawson	80	Votes
Manitoba—M. A. Parker	71	"
Alberta—A. L. Lehmann	99	"
Saskatchewan—R. McLaurin	66	"
Ontario—L. E. Westman	77	"
E. G. R. Ardagh	72	"
W. Lash Miller	72	"
L. T. Acton	70	"
S. J. Cook	62	"
Quebec—H. J. Roast	95	"
R. F. Ruttan	79	"
J. S. Bates	67	"
G. Baril	61	"
Nova Scotia—I. C. Mackie	76	"
New Brunswick and Prince Edward Island— H. E. Bigelow	56	"

According to the By-Laws the five members receiving the highest votes shall serve for three years, these members are, therefore:

A. L. Lehman	99 Votes	R. F. Ruttan	79 Votes
H. J. Roast	95 "	L. E. Westman	77 "
J. A. McD. Dawson.	80 "		

The five receiving the next highest votes to serve for two years, these gentlemen therefore are:

I. C. Mackie	76 Votes	M. A. Parker	71 Votes
E. G. R. Ardagh	72 "	L. T. Acton	70 "
W. Lash Miller	72 "		

Leaving the following gentlemen to serve for one year:

J. S. Bates	67 Votes	G. Baril	61 Votes
R. McLaurin	66 "	H. E. Bigelow	56 "
S. J. Cook	62 "		

(Signed) WM. C. LODGE.
DR. HENRI LAROUCHE.

MAGNESITE AND SHELL-MAKING.

During the war magnesite was found useful in the manufacturing of shells, and now the "Engineering and Mining Journal" of New York reports that Mr. H. F. Weirum has been experimenting with ground magnesite as a substitute for lime in making egg shells. He finds that hens fed on the ground magnesite produce a very superior grade of shell. Apparently the old bone-grinding machine used so often in hen yards will soon have to give way to packages of magnesite. As the "Canadian Mining Journal" says in reference to the matter." It is another example of how the old established industries have been helped by the hunt for substitutes."

ANTIMONY IN NEW BRUNSWICK.

An effort is being made by the North America Antimony Smelting Co., Ltd., of St. John, N.B., to consolidate a number of individual holdings which have been operated in the past in a small way. The field for antimony products in paint and rubber industries in Canada seems to warrant the effort.

DEVELOPMENT OF SASKATCHEWAN SULPHATE DEPOSITS.

A company known as Soda Deposits, Limited, of Calgary, proposes to build a plant for the production of Glauber's salt at Fusilier, Saskatchewan. This is a lake deposit and, according to J. C. Williams, manager, initial production will amount to 20 tons sodium sulphate per day.

BOOK REVIEWS

"COAL TARS AND THEIR DERIVATIVES."

By G. Malatesta; Revised 1920 Edition; 530 pages; E. & F. N. Spon, Ltd., London. Price, 22s. 6d.

It is rather difficult to revise a book at the present time. Few have had either the time, opportunity or literature at their command. Evidences of this are found in tables of production, more particularly those relating to America. Plant practice has not been followed as closely as would be expected. When, for example, it is possible to say that the Hird Continuous Process for Tar Distillation has been placed in 160 plants in operation in England, during the last eight years, it would be expected that something might be mentioned about it in a book bearing the date of 1920.

At the same time, a fund of information and illustrations are given, which show very careful consideration of lines of development. The recovery of tar from all sources is outlined. Consideration is given first to the production of tar from illuminating gas; and in the process of manufacturing coke. A chapter on the chemical nature of tar compounds follows, and is a particularly good survey of the chemistry of the tars. Compounds are well described, and theoretical discussions taken up fully. The second part of the work is devoted to distillation practice, and a description of products formed. Chapters are devoted to full discussion of pitch and the distillation of lignite. The book is made complete by the addition of a large analytical section, where detailed directions are given for analytical determinations and separations of by-products.

"A TEXT BOOK OF PAPER MAKING."

By C. F. Cross and E. J. Bevan; Fifth Edition; 1920; 527 pages. E. & F. N. Spon, Ltd., London. Price, 31s. 6d.

Although Canada is a large producer of paper, the vast tonnage represents a more or less uniform production of grades, based on our timber resources. Paper-making as a general art, involving a multitude of raw materials, is not a subject with which Canadian manufacturers are particularly well acquainted.

The latest edition of this book introduces the subject with a full consideration of our present knowledge of cellulose, and passes on to the physical structure of fibres and the chemical analysis of plant substances. With this good, scientific basis developed, a summary of the special treatments given fibres follows. Practices in the operations of bleaching, beating, sizing, loading and coloring are shown. This is followed by a chapter on the general machinery of mills, and one on the use of caustic soda and soda recovery. The remaining portion of the book is devoted to structural and chemical characteristics of paper, paper testing and some notes for analysts in paper mills.

It is quite conceivable that the study of such a book by Canadian paper makers, chemists and pulp mill engineers would assist them greatly in developing a better conception of practices elsewhere. In reading such a work, one is impressed by the lack of attention given to engineering practices now being operated in a very large way in Canada. As a text-book of Paper Making, it is quite up to standard, as far as it goes, but it would not allow the student who graduated from it to build or operate, for example, the paper mills on the St. Maurice River, Que. Because it relates to other things than those with which the average Canadian paper-maker is familiar, it should find its place in plant libraries.

MODERN PULP AND PAPER MAKING.

By G. S. Whitham, Sr. 600 pages, large 8 vo. The Chemical Catalog Company, Inc., New York: $6.00. Westman Press, Ltd., Toronto.

This is perhaps the most notable work on Pulp and Paper in North America since the publication of "The Chemistry of Paper Making," by Griffith and Little, in 1894.

In some ways the present work is unique. The practical working details given, for maintenance and repair of parts, and the notes on machine design are examples of this.

The author's claim that the work is a practical treatise is well borne out, indicating wide experience. This is evident in the descriptions of individual machines and parts.

We cannot agree with the author (pg. 233) that "There does not seem to be any good reason why American clays should not be more used in this country than they are." The last three words, by the way, are typical of the author's tend to redundancies It is our opinion that one good reason is that American clays are not so carefully prepared for the market, are of a different geologic history resulting in lower plasticity and a harder texture and contain fine granular particles rich in iron.

Chapter xviii, on Paper Defects, is of very practical interest and value.

We differ slightly in detail, but not in principle, with the reference to the chemist "confided to the laboratory" (P. 463). We believe that in most mills there is enough work to keep a man engaged in the laboratory all the time under the direction of the man with broader knowledge spoken of. No adequate carrying out of routine testing is possible on the part of a man who is expected to be in technical control.

There is an excellent treatment of boiler room and power plant, and a valuable record of power required for various machines, but a noticeable lack of reference to lubrication and lubricants. The only reference to lubrication that we have noted in a necessarily rapid examination of the work is on P. 502, in the paragraph on Calendar Cuts.

We have referred to redundancies. These are especially noticeable in a paragraph on P 7, where fourteen words out of a total of about one hundred are redundant. In the first sentence, "Almost all vegetable substances contain cellulose in some form and to some extent," the last seven words add nothing but compositor's wages to the value of the book. In the same paragraph the author falls into the trap of a double negative. On P. 5 the formula of cellulose is given as $C_6 H_{10} O_5$. Apart from the obviously overlooked error in the exponent of carbon, there is no reference to the fact that the molecule is an unknown multiple of $C_6H_{10}O_5$.

There is indication of a little slackness in proof-reading, as on P. 6, in Dr. Johnsen's table, the word "Liquid" is given at the head of the fourth column instead of "Lignin."

The work is, in spite of these minor defects, a very worthy contribution to the industry with a practical treatment not elsewhere given.

The pulp and paper industry is indebted to Mr. Witham for his book and the much painstaking attention to detail, and the technical public is supplied with an excellent hand book.

"T. L. C."

CANADA AS A SOURCE OF HELIUM.

Early in 1915, Dr. J. C. McLennan, professor in charge of the Department of Physics at Toronto University, was requested by the Board of Invention and Research, London, England, to investigate the helium content of the natural gas supplies within the Empire. The necessity for such an investigation and the importance of it was, of course, the replacement of helium gas for hydrogen in aeronautics. The results of this investigation have been offered to the Mines Branch of the Department of Mines of Canada by Dr. McLennan, and now appear in bulletin form, "Bulletin No. 31, Report on Some Sources of Helium in the British Empire." Recently also (June 17th) Dr. McLennan before a crowded meeting of the Chemical Society, London, England, gave a lecture in which he described the developments which led up to the manufacture of helium on a large scale for war purposes. It has been shown that the largest source of supply of helium at present known within the Empire is located in Canada.

The importance of this work of Dr. McLennan and his associates cannot be over emphasized, not only as a great war work, but also as the commencement of the production of helium on a commercial scale from certain Canadian natural gases. It is interesting to note that Dr. Alfred W. G. Wilson, Engineer in Charge of Investigation of Chemical Industries, states in his letter of transmission of Dr. McLennan's manuscript to Dr. Eugene Haanel, Director Mines Branch, "this production (of helium) may become an important factor in the development of an aeronautical service in this country and probably in other parts of the Empire." From the Mines Branch Report, and from Dr. McLennan's address to the Chemical Society the principal points in connection with the work on helium would seem to be the following: Helium has been found in varying quantities in most of the natural gases of Canada, but the Blackheath field in South-Western Ontario, and the Bow Island Field in Alberta have tested out the largest per centage of helium, in the former .34 per cent. and in the latter .34 per cent. Wells in the Selkirk-Rainham-Dunnville (Ontario) Field Onondaga Field (Ontario) from .25 to .32 per cent. helium; Onondaga Field (Ontario) from .25 to .32 per cent. helium, in the Welland (Ontario) Field from .21 to .26 per cent. helium; in the Toronto field, .009 to .013 per cent. helium; in the Medicine Hat Field (Alberta), ..1 to .13 per cent. helium; in the Suffield-Brooks-Bassano-Calgary Field (Alberta), .06 to .15 per cent. helium. Smaller results were obtained in other Alberta fields. In New Brunswick the helium content was only 0.064 per cent., according to a determination made by R. T. Elworthy. In British Columbia the helium content of the natural gas was from .003 to .028 per cent.

The principle gases found in natural gas are Methane, Ethane, Nitrogen, Oxygen, Helium and Carbon Dioxide.

Production of Helium.

In the Spring of 1916, Dr. McLennan made a report in which he recommended that a semi-commercial unit should be erected and a trial made to see whether the helium could be extracted from the natural gas. The Admiralty authorities at first did not favor the idea, and it was not until the middle of the summer of 1917 that the Admiralty authorities concurred in his plan, and commisioned him to proceed with the actual production of helium. As there were large quantities of natural gas in Texas, Dr. McLennan suggested that the American government should develop that field. The Americans had already commenced work there through a communication from the late Sir William Ramsay. The American Army and Navy however were not very appreciative of the value of such work in Texas, though their Bureau of Mines was interested. In August, 1917, Dr. McLennan and his associates made an actual start at production at Hamilton, Ontario, after very considerable difficulty in securing the proper apparatus, borrowing a Claude Oxygen-producing column from the works of the company working that process in Toronto, getting a compressor at Oldbury, England, through the kindness of Sir George Beilby, and some cylinders from the Royal Air Force. In this way he got some cylinders and two or three pumps which were sent over to Canada, and by March, 1918, he had produced at Hamilton a large quantity of helium of 87 per cent. purity. The American government had in the meantime, as a consequence of what was being done at Hamilton, set aside one and a half million dollars which was divided between their mines Bureau, the Linde Company, and the Air Reduction Company, and commenced work on production in Texas. Later on, the Americans produced large quantities, and by the time of the Armistice had produced about 160,000 cubic feet. Their method was different from that used by Dr. McLennan at Hamilton, and proved very expensive. They had a closed cycle for the carbon-dioxide and a closed nitrogen cycle. The United States Bureau of Mines, not satisfied with the results, had experimented with a Norton Jeffries machine, originally designed to produce oxygen, and Dr. McLennan stated in his London address that he believed they were still working at this machine, as he had received no intelligence that they had been able to produce helium with it as yet.

Dr. McLennan does not believe that there should be any particular difficulty in developing suitable apparatus for securing helium from natural gas. The main point to consider and the chief difficulty was to secure proper balance between heat exchangers, liquifiers, vaporising columns and rectifying columns, so that each gas could be liquified out at its suitable temperature, and by the exchange of cold or heat carry out the operation in the most economic possible way. Having settled finally which column would do the work, after a series of trials, a station was established at Calgary, Alta., in September, 1918. The final type of column, however, was not evolved from the original Claude column until the summer of 1919, and with this machine helium was regularly produced of a purity of 87.90 per cent. The latest type of machine had been in use from December 3, 1919, until April 17, 1920, and in that time the rate of production had doubled. In April the plant was producing 700 to 800 cubic feet per run. In one week it produced nearly 2,000 cubic feet. With further experience, Dr. McLennan believes that it would be possible to obtain helium gas of 97 per cent. purity and with an efficiency of 80 per cent. The estimated cost of production is less than 2½d. per cubic foot. The market price for the gas in 1914, if it were possible to secure any, was £300 per cubic foot.

At the close of his lecture to the Chemical Society, Dr. McLennan pleaded strongly for the establishment of a cryogenic laboratory, in order that a laboratory and supply station might be maintained preferably at Calgary. The capital sum required would be £35,000, while the interest on £125,000 or £150,000 would maintain the station.

It is announced that the Honorary Advisory Council of Scientific and Industrial Research of Canada has awarded

the sum of $5,000 to assist Dr. McLennan in his work on conserving helium.

It is well to remember that Canada is the only part of the Empire that contains helium in any worth-while quantity. The helium content of the gas in New Zealand is only 0.077 per cent, while gases tested in Italy contained no helium whatever. In his work on helium investigations, Dr. McLennan received valuable assistance from his colleagues, Professors John Satterly, E. F. Burton, and H. F. Dawes, of Toronto University; Captain H. A. McTaggart; Mr. John Patterson, of the Meteorological Branch, Ottawa; and Messrs. V. F. Murray, E. Edwards, J. T. F. Young, H. J. C. Ireton, and Mr. K. H. Kingdon, of Toronto University.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Catalyst.

W. P. Schuck, 200591, June 1, 1920. A catalyst suitable for use in hydrogenation processes.

Ammonium Sulphate.

Fred. W. Sperr, Jr., 201471, June 29, 1920. Preparation of a neutralizing agent for treating $(NH_4)_2SO_4$ crystals.

Manufacture of Zinc Chloride.

Oliver W. Storey, 201046, June 15, 1920.

Manufacture of Alumina.

Eric C. Dutt, 201087, June 15, 1920 and also 201308, June 22, 1920. Bauxite mixed with NaCl, $Ca(OH)_2$ and C is heated to red heat As_2O_3 is passed through the hot mixture to convert the Al into $Na_2Al_2O_4$, which is dissolved and CO_2 is passed through the solution to ppt $Al(OH)_3$, the solution is filtered and the ppt calcined.

Manufacture of Magnesia.

Eric E. Dutt, 201088, June 15, 1920.

Propellent Explosives.

A. S. O'Neil, 198561, March 23, 1920. Nitrocellulose powder grains are mixed with dinitrotoluene comphor and diphenylamine. The grains are then dried and glazed.

Converting Atmospheric Nitrogen Into a Compound Containing Combined Nitrogen.

F. W. de Jahn, 201059, June 15, 1920.

Synthetic Production of Ammonia.

H. C. Greenwood, 201367 and 201368, June 29, 1920.

Manufacture of Aluminium Compounds from Silicates.

V. M. Goldschmidt, 201459, June 29, 1920. Minerals rich in plagioclases of the labrodarite-anorthosite series are treated with HNO_3 to form a solution containing Al nitrates, leaving the mineral rich in Fe undecomposed and the Al compounds are recovered by pptn.

Manufacture of Metallic Chlorides.

Wm. Heap and Edgar Newbery, 200907, June 15, 1920. Anhydrous metallic chlorides are made by heating an oxide or hydrate of the metal in the presence of Cl and producer gas free from H.

Process of Producing Aluminium Compounds.

H J. Goldschmidt, 201460 and 201458, June 29, 1920. Materials containing Al are treated with HNO_3 and the nitrates formed heated to about 300° to form Al_2O_3, leaving the remaining nitrates undecomposed. The Al_2O_3 is recovered by lixiviation.

Manufacture of Cyanides.

F. J. Metzger, 201032 and 201031, June 25, 1920. A mixture of carbonaceous material, an alkali metal and about 2 to 5% of finely divided Fe is heated in the presence of N gas to a suitable temperature. The product is extracted with a suitable solvent, giving a cyanide solution free from any appreciable amount of ferro-cyanide.

Commercial Production of Calcium Carbonate and Magnesium Oxide From Dolomite.

Jno. N. Robinson, 201398, June 29, 1920. $CaCO_3$ and MgO are produced by calcining dolomite, mixing with it a solution of $CaCl_2$ in such proportion that the MgO is chemically equivalent to the $CaCl_2$, and when the mixture is thoroughly slacked and incorporated, passing CO_2, therethrough to convert all the lime into $CaCO_3$, which is filtered off. The remaining solution of $MgCl_2$ is then agitated with dolomite in such proportion that the lime in the latter is chemically equivalent to the MgO in the solution, the solution is boiled and filtered and the Mg hydrate calcined.

Process of Manufacturing Cyanamide.

Wm. H. Middleton, 201038, June 15, 1920. The cyanamid ovens are lined with corrugated sheet material pervious to N gas, but impervious to finely ground carbide to provide a multitudinous number of small passages for the gas, a passage for the gas is provided in the body of the carbide which fills the oven to the lined walls. N is introduced and the charge ignited.

Method of Making Calcium Cyanamide.

Geo. E. Cox, 201033 and 201034, June 15, 1920. The efficiency of the nitrifying process in making CaCN is increased by supplying the ovens with empty carbide holders, filling the holders while in the ovens to preserve the porosity of the mass, and causing N to permeate the porous mass while the reaction is proceeding.

Producing Concentrated Nitric Acid.

O. Jensen, Einar Bergve, 201480 and 201481, June 29, 1920. Currents of N oxide, O and dilute HNO_6 are passed in contact with each other through a series of reaction spaces under super atms pressure, the current of O passing in parallel to the HNO_3 through each individual reaction space and in the reverse order to the series of reaction spaces considered as a unit.

Processes of Producing Concentrated Nitrous Gases.

Birger F. Halvorsen, 201479, June 29, 1920. Dilute nitrous gases are passed in contact with a dry mixture of substances comprising a dry base and an oxide of a metal forming easily decomposable compounds with alkaline earth metals and the resultant product is heated to decompose the compounds formed by the action of the nitrous gases on the metal oxide.

Method of Refining Raw Wood Pulp Liquor.

P. Hein, 202602, August 3, 1920.

Methyl Ethyl Ketones.

Chas. Weizman, 203264, August 24, 1920. Methyl-ethyl ketone is prepared by subjecting secondary butyl alcohol to the action of a catalyst (Cu-Ni) at about 200°.

Acetone and Other Volatile Substances from Waste Liquors from Soda Pulp Process, etc.

V. Drewsen, 202945, August 17, 1920. Black liquor from the soda pulp process is concentrated until it contains 50% water, treated with NaOH equal to 20% of the organic substances present and boiled under pressure at 125° for at least an hour to effect conversion of organic substances, and is then evaporated and converted into a dry mixture after addition of $Ca(OH)_2$ to an amount about equal to the organic substances present. This dry material is subjected to dry distillation with steam at 300-500° to recover acetone, MeOH and other volatile products. A yield of 5-10% of these substances (based on the amount of organic substances present in the liquor) may be obtained together with about the same quantity of heavier oily distillate and the solid residue left may be burned and extracted to obtain inorganic salts.

Causticized Ligneous Acetate Material from Waste Soda Pulp Liquor.

V. Drewsen, 202946, August 17, 1920.

Acetone and Alcohol from Waste Sulphite Liquors.

V. Drewsen, 202947, August 17, 1920.

Zinciferous Ores or Concentrates.

J. H. Gillies and P. McP. Gillies, 203169, August 24, 1920. Zn ores and concentrates are treated after crushing and roasting with H_2SO_4 to dissolve the ZnO; the $ZnSO_4$ solution is then purified with BaS and electrolized.

Method of Treating Nickel Matte or Nickel Copper Matte.

O. Lellep, 202440, August 3, 1920. The matte is subjected to the action of an oxidizing agent at a temperature between the m.p. of the metal to be produced and that of NiO (1750°) under non-acidic furnace conditions. To insure the reduction of pure metallic Ni in treating Ni matte and pure Ni-Cu alloy in the case of Cu-Ni matte any remaining trace of S must be removed by heating with a slag containing Ca_2 or other method.

Causticized Organic Material Suitable for the Production of Acetone.

N. Statham, 203049, August 17, 1920. A strong porous material weighing not over 40 lbs. per cu. ft., and suitable for dry distillation for the production of acetone and other products by dry distillation with steam is formed by concg waste soda pulp liquor with the addition of soda and mixing the concd material with lime.

Manufacture of Sulphate Pulp.

E. Olsson, 202467, August 3, 1920. In the recovery process in the manufacture of sulphate pulp $NaHSO_4$ is added to the black liquor before evaporation is caused to take place. The free acid in the nitre cake converts part of the Na_2CO_3 of the liquor into Na_2SO_4.

BRITISH COLUMBIA MINERAL STATISTICS.

The "Annual Report of the Minister of Mines" for the year ended December 31, 1919, was issued towards the end of July, 1920, about a month or six weeks later than usual. The following tables show the mineral production of the province and the production by districts, respectively:

Total Mineral Production.

	— 1918 —		— 1919 —	
	Quantity.	Value.	Quantity.	Value.
Gold, placer (oz.)	16,000	$ 320,000	14,325	$ 286,500
Gold, lode (oz.)	164,674	3,403,812	152,426	3,150,645
Silver (oz.)	3,498,172	3,215,870	3,403,119	3,592,673
Lead (lb.)	43,899,661	2,928,107	29,475,968	1,526,855
Copper (lb.) ...	61,483,754	15,143,449	42,459,339	7,939,896
Zinc (lb.)	41,772,916	2,899,040	56,737,651	3,540,429
Coal (tons, 2,240 lb.)	2,302,245	11,511,225	2,267,541	11,337,705
Coke (tons, 2,240 lb.)	188,967	1,322,769	91,138	637,966
Miscellaneous products	.....	1,038,202	.....	1,283,644
		$41,782,474		$33,296,313

Mineral Production by Districts.

	Divisions.		Districts.	
Names.	1918.	1919.	1918.	1919
Cariboo District .	.....	.....	$ 383,996	$ 196,801
Cariboo and Quesnel Mining Division	$ 83,500	$ 73,500	.....	.....
Omineca Mining Division	300,496	123,301	.....	.....
Cassiar District..	.....	.....	9,178,441	6,402,082
E. Kootenay Dis.	.....	.....	7,259,897	6,612,954
W. Kootenay Dis.	.....	.....	6,113,279	4,669,090
Ainsworth Div.	663,388	405,478	.....	.....
Slocan and Slocan City Div.	3,675,762	2,900,087	.....	.....
Nelson Division	396,697	76,719	.....	.....
Trail Creek Div.	1,357,571	1,275,538	.....	.....
Other parts	19,861	11,268	.....	.....
Boundary-Yale Dis.	.....	.....	4,961,452	2,527,514
Osoyoos, Grand Forks, and Greenwood Divisions	3,897,826	1,637,827	.....	.....
Similkameen, Nicola, Vernon .	909,869	759,639	.....	.....
Yale, Ashcroft, Kamloops . ..	153,757	130,050	.....	.....
Lillooet Dis.	.....	.....	57,746	62,684
Coast Dis. (Nanaimo, Alberni, Cloyoquot, Quatsino, Victoria, Vancouver	.....	.....	13,827,663	12,825,188
			$41,782,474	$33,296,313

The figures vary considerably from those of the preliminary estimate, which was issued in January, the zinc output in particular being more than thirteen and a half million pounds more than the early figures. Some doubt, in fact, has been cast upon the final figures given as the zinc output, as it is about double the zinc output of the Consolidated Mining & Smelting Co., which is generally considered to be by far the largest producer in the province. If the figures in the minister's report are accurate it means that about half of the zinc output was manufactured in the United States.

Canadian Abrasives, Ltd., has been organized, and ground has been broken for the factory on Mason street, in Victoria. The company is capitalized at $100,000, half of which will be spent on the factory building and plant. The local government, through the Department of Industries, has granted a loan of $22,000, at 6 per cent. The company will manufacture abrasive powders and papers from natural products. There are several deposits of high-grade silica and garnet sands in the province, well suited for abrasive purposes.

Mining Notes.

J. W. D. Moodie has resigned from the management of the Britannia Mines, Ltd., and, after a long holiday will take up his residence in California. B. B. Neiding, who has operated a number of mines in the State of Washington, has been appointed in Mr. Moodie's place. Mr. Moodie has managed the Britannia mines for several years, and his energy and foresight have been intrumental in placing the property in the splendid position it is now in.

The following companies have been incorporated recently: Mexicanda Petroleum Co., $100,000, Vancouver; Canadian Industrial Petroleum Co., $100,000, Vancouver; Liberator Mining Co., $100,000, Vancouver; Outland Silver Bar Mining Co., $500,000, Vancouver; Arrow Coal Co., $20,000, Seattle; Vancouver Island Coal Development Co., $10,000, Vancouver; British Columbia Quarries, $50,000, Vancouver; United Oil & Gas Co., $300,000, Vancouver; and Slocan Consolidated Silver Mines, $300,000, Kaslo, B.C. All are limited liability companies.

The discovery of rich gold-silver ore on the Marmot River, in the Portland Canal division, has caused a rush to that district, and more than 100 claims have been taken up.

CATALOGUES RECEIVED.

Maurice A. Knight, Chemical Stoneware.—As a guide to the possibilities of design of acid-proof chemical stoneware apparatus, the new 34-page folder of Maurice A. Knight, acid-proof chemical stoneware manufacturer, of East Akron, Ohio, is something that every chemical manufacturer, particularly those making or handling acids, would do well to have on hand. The folder is well illustrated, sectional views of parts of apparatus being shown and described. Various explanatory and instructive articles on the subject of chemical stoneware, its uses and limitations are also found in the folder.

The Inco.—This is the name of the bi-monthly publication of the International Nickel Company of Canada, the issues having now reached the third, the first appearing in March last. It is not a catalogue in any sense, but rather a descriptive booklet, describing in well written, scientific articles, monel metal, together with its varied uses and applications. As an indication of the progressiveness of the company, as shown by the publication, No. 3 contains the following articles: Real Selling Helps for Manufacturers and Distributors of Monel Metal, Optical Reflecting Power of Nickel and Monel Metal, Nickel Coinage, Hydro-Electric Power Plant for Mining and Smelting of Nickel Ores. The work is well illustrated.

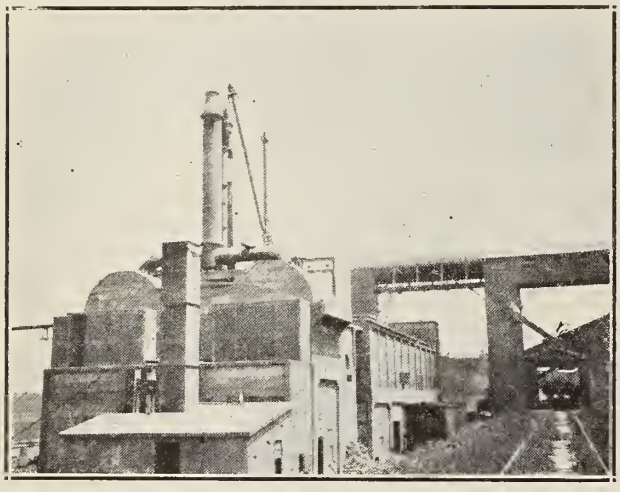
Whatman Filter Papers—(containing Canadian price list).—A fifteen-page illustrated catalogue describing every kind of Whatman Filter Papers. H. Reeve Angel & Co., 7-11 Spruce Street, New York, are the agents, from whom a copy may be obtained.

The Carbon Electrode.—The National Carbon Company, New York, N.Y., have recently gotten out an illustrated booklet of 18 pages, describing their types of carbon electrodes for electric furnaces. Features of the booklet are instructions as to handling and installation of electrodes, and a bibliography of books and periodical articles on the electric furnace.

Brotherton and Company, Ltd., Ammonia and Tar Distillers, Leeds, England, have issued three additional numbers to their Hydrosulphite Booklets—"Straw Bleaching," "Oil Bleaching," and "Glue Bleaching." The bleaching, in each case, is done by the Brotherton compound, "Hydros," an abbreviated form of the name "Hydrosulphite of Soda," a white crystalline compound formed by the further reduction of sodium bisulphite.

POTASH RECOVERY PLANT COMPLETED.

The potash recovery plant at the works of the Canada Cement Company, at Port Colborne, Ont., has been completed and will be in full operation shortly. A test run has just been made within the past few days and everything worked satisfactorily. As is well known, great quantities of cement dust, rich in potash content, are emitted from the flue of a cement plant, and it is to conserve this valuable potash that the recovery plant was built. The plant as installed will recover from the cement dust 7,000 pounds of K_2O per day. The accompanying photograph shows the recovery plant as it appeared when nearing completion two months ago. On the right is the flue conducting the gases over from the cement plant. The flue leads down into the spray chamber, while in the very foreground of the picture the evaporators are shown with the barometric condenser on top. The installation was carried out under



Potash Recovery plant, Port Colborne, Ont.

the direction of Mr. J. G. Dean, chemical engineer, who invented and patented the system of evaporator-condenser used. This evaporator is placed, as shown in the photograph, just beyond the spray chamber.

In discussing this system with Mr. Dean, recently, he kindly gave a description of the operation of this evaporator, which he had first installed at the plant of the South-Western Portland Cement Co., at Victorville, Cal. The plan was to spray the hot gases with sufficient water to wash out the particles in suspension, filtering the spray water from its insoluble sludge, and evaporating the filtrate. For this latter operation every consideration pointed to the desirability of using the flue gases as a source of heat. At Victorville, at the first installation, careful consideration was given as to whether to build the evaporator ahead of the spray chamber or beyond it, the latter being decided upon; in case hot furnace gases above 100 deg. C. were used, an evaporator at atmospheric pressure could be utilized, thus simplifying and lightening the evaporator construction and obviating the need of vacuum pump and condensers. However, if these gases were sprayed, they would have required large radiating surfaces or else a great amount of vaporized water would have been lost in the hot saturated stock gases. It was also early found, stated Mr. Dean, that the largest excess of water dripping through dusty gases failed to wet and precipitate satisfactory amounts of the solids rich in potassium. If saturated dusty gases are cooled, however, so that the water vapor contained will condense, the nascent globules of mist form about the dust particles as nuclei. Then if the resulting fog can coalesce and be collected in some way, the result will be a dust-free gas saturated with vapor at the temperature of escape, and a sludge containing soluble salts in solution and insoluble particles in suspension. It was, therefore, not only necessary to thoroughly humidify the hot gases, but even more necessary to cool the gases to the least possible temperature before their discharge. The radiating heat from these cooling gases could naturally be utilized to evaporate the considerable quantites of weak solutions produced, that is, every pound of water condensed would give up sufficient heat to evaporate another pound of water. Therefore, a condenser-evaporator was designed by Mr. Dean and placed after the spray chamber. In operation the water which condenses within the tubes evaporates the same amount outside the tubes; the cooling furnace gases give up heat to evaporate excess additions and the gases escape at low temperature with their waste heat largely abstracted and utilized.

MINING AND METALLURGY IN BRITISH COLUMBIA.

The Canadian Collieries, Ltd., which owns extensive coal areas and collieries on Vancouver Island, recently has been reorganized with additional capital. Due to the erratic nature of the market for its coal, the company has had a good deal of difficulty with labor, being short-handed when it most needed men, and has operated under expensive conditions. To obviate this, the board of directors for some time has seriously been considering the starting of an iron and steel industry in connection with its collieries, and has sent its chairman, Henry E. Fleming, to investigate conditions on the Pacific Coast. Already he is satisfied with the quantity of ore and its suitability for the manufacture of iron and steel, what remains to be discovered is whether the ore can be obtained on reasonable terms and whether there is a sufficient market west of the Rockies for the output of such a plant.

Late last fall a good deal of attention was attracted to the limonite deposits in the neighborhood of the Taseko, or Whitewater River, in the Clinton mining division, and W. M. Brewer, a provincial resident mining engineer, was sent to make an examination. Mr. Brewer reported that, owing to the fact that practically no development work had been done, it was impossible to arrive at any exact figures, but he roughly estimated from analogy to like deposits in other parts of the world that there possibly was some 50,000,000 tons of ore assaying between 40 and 50 per cent of iron in the basin, much of which could be mined by a steam shovel. This report has attracted the attention of British capitalists, and a more thorough examination of these deposits now is being made. The provincial government has sent Mr. Crossland, of Vancouver, to the deposit to carry out investigations as to the actual extent of the deposit and to make a survey of its accessibility, and the Canadian Geological Survey has sent George C. Mackenzie to make an examination and report of the geological conditions and extent of the deposit. Should these reports corroborate Mr. Brewer's rough preliminary estimate, it is pretty certain that the British capitalists will develop the property and start an iron and steel industry somewhere on the coast of British Columbia. Between these two parties there seems to be some likelihood of a much-desired iron and steel industry being started in the not very distant future.

Changes Made by Granby Co.

There has been a general change in the management of the Granby Consolidated Mining, Smelting & Power Com-

pany's British Columbia interests. R. F. M. Silvester, who has been the managing director of the company for the past ten years and to whom the present vast developments of the company in the province are largely due, has retired, and H. S. Munroe has been made general manager of the company in British Columbia, with E. P. Mathewson as consulting metallurgist. Mr. Munroe or Mr. Mathewson need no introduction; both have accomplished good work, especially Mr. Mathewson, in connection with the remodelling of the Anaconda Copper Company's plant, in Arizona. The coal from the company's colliery at Cassidy, on Vancouver Island, it is stated, is not giving a satisfactory coke in the by-product ovens, at Anyox, and coal is being obtained from eastern British Columbia by way of Prince Rupert to mix with it. Anyox will now become the headquarters of the company.

During the past few years the Granby Company has been at enormous expense. It has purchased the coal areas at Cassidy and has developed a modern colliery there and a model settlement with every accommodation for its employees, and it has built an up-to-date battery of 30 by-product coke ovens at Anyox. It was intended that these improvements should have been financed out of surplus, but, owing to the slump in the price of copper since the armistice, this has been found to be impossible, and a bond issue had to be floated to pay for the improvements. During the last six months of 1919 the Granby Company produced 11,260,585 pounds of copper, 670,486 ounces of silver, and 9,697 ounces of gold. It cost about 15 cents per pound to produce the copper and the average sale price was 19.6 cents.

The Dolly Varden Mines Co. and the Taylor Mining Co. have reached a mutual agreement with regard to the terms of settlement between the two companies, and now the mine is securely in the hands of the Taylor Company. The latter company already has let a contract for a hydro-electric plant, costing $65,000, to expedite the development of the mine. The railway between the mine and tide-water is in operation, once again, and regular shipments of ore are being made to the Granby smelter, at Anyox. Owing to the fortunate fact that the Dolly Varden ore acts as a flux for the Hidden Creek ores, the Taylor company has been able to make very favorable terms, the treatment charge being only $1.50 per ton, with a return of 95 per cent of the silver.

For some time there has been a disagreement between the One Big Union and the mine operators in the Slocan district, and, though the union has not succeeded in closing the mines, as it did the Premier and Dolly Varden mines for a while, it has considerably reduced output, owing to a shortage of labor. At the very start of the trouble, the Consolidated Mining & Smelting Co. closed all but development work at its Rossland mines, and thus forestalled the Union. During the cessation of mining, the company has overhauled its copper blast-furnaces, and increased the capacity of the refinery plant from 20 to 50 tons of copper per day. It has installed three sintering furnaces, preparatory to treating the Canada Copper Corporation's concentrate, which is expected to commence arriving about the middle of September. The numerous concentrating plants, when completed, will have a total capacity of more than 2,500 tons of ore daily.

Sullivan Ore Used to Test Processes.

After running the wet magnetic concentrating plant side by side with the Minerals Separation plant for some six months to discover which was the better form of concentration for the Sullivan mine ores, the latter plant has been awarded the palm, and the wet-magnetic concentration plant is being dismantled. Another flotation plant will be erected immediately the present plant has been demolished. Both these plants, while working on a commercial scale and treating in the neighborhood of 1,000 tons of ore daily, are really of an experimental nature to determine the exact style of plant that ultimately is to be erected at the Sullivan mine at Kimberley, the first unit of which is to have a capacity of 2,500 tons of ore per day.

The rush to the Alice Arm and Salmon River districts is maturing, though it is doubtful if it will reach the proportions anticipated.

The Premier mine continues to develop well. Considerable ore, running between $250 and $300 per ton, was shipped to the American Smelting & Refining Company's smelter at Tacoma, during the winter, and the quantity would have run into several thousands of tons, but for the strikes, which held the mine up for a considerable part of the winter. A 100-ton concentrating plant has been shipped to the mine, and is being erected under the supervision of experts from the staff of the American Smelting & Refining Co., which company own a considerable share in the property.

PROGRAM OF SIXTH NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES. NEW YORK, SEPTEMBER 20 TO 25.

When the Sixth National Exposition of Chemical Industries opens its doors in Grand Central Palace, New York City, Monday, Sept. 20, it will be the biggest display of its kind that has ever been seen. The total number of exhibitors to date exceeds 450, as against a high record for previous shows of 358, made in Chicago last year.

To house this large display, four floors of the Palace are necessary, and the Chemical Show is the only exposition, outside of the annual automobile show, that requires such enormous floor space. There will be a remarkably wide range to the exhibits this year, and it has been decided to divide the exposition into sections. The Fuel Economy Division and the Material Handling Division, both new this year, have attracted many prominent concerns.

Five symposiums are on the week's programme, and at all of these men of prominence in the chemical world will speak. The symposiums are divided into the following classifications: Fuel Economy, Materials Handling, Industrial Management, Chemical Engineering and Ceramic. Motion pictures will be a feature every evening, and these should prove of great interest to the public.

One of the features of the week will be the meeting of Chemical Warfare Post, American Legion. At the request of this post the management set aside the evening of Wednesday, Sept. 22, for them to transact business. This post is composed of men who served in the war, and will be open to all C. W. S. men.

Dr. Charles H. Herty, chairman of the advisory board of the exposition, will open the display at 8 p.m. on the evening of Monday, Sept. 20. He will be followed by Charles L. Reese, who will talk on "Co-operation in the Industries," and Erastus Hopkins, who will talk on "Problems of the American Exporter." Sir George E. Foster, Canadian Minister of Trade and Commerce, will be the guest of the evening.

The motion picture programme for the opening night consists of two subjects, "The United States Ammonium Nitrate Plant No. 2, at Muscle Shoals," by courtesy of

Dwight P. Robinson & Co., and "Modern Packaging Methods," by courtesy of the Pneumatic Scale Corporation.

Beginning Tuesday, afternoon and evening sessions will be held in order to carry out the big programme. The programme in detail follows:

Monday, September 20.

8.00 p.m.—Opening address by Charles H. Herty. "Co-operation in the Industries," Charles L. Reese. Sir George E. Foster, Canadian Minister of Trade and Commerce, will speak. Followed by motion pictures: (1) "The U.S. Ammonium Nitrate Plant No. 2 at Muscle Shoals" (2 reels), (courtesy P. Robinson & Company); (2) "Modern Packaging Methods" (4 reels), (courtesy Pneumatic Scale Corporation).

Tuesday, September 21.

2.00 p.m.—Fuel Economy Symposium. Chairman's Address, R. C. Beadle, managing editor, "Combustion." "Burning Coal at 100 Per Cent. B.t.u. Efficiency," W. O. Rankin (Quigley Furnace Specialties Company). "Saving Fuel by Controlling Chimney Losses," F. F. Uehling (Uehling Instrument Company). "Fluid Heat Transmission," Alexander B. McKechnie (Parks-Cramer Company). "Producer Gas and the Modern Mechanical Producer," W. B. Chapman (Chapman Engineering Company). "Refractory Cement: Life Insurance for a Furnace," F. W. Reisman (Quigley Furnace Specialties Company). "Preventing Conduction and Radiation Heat Waste," S. L. Barnes (Armstrong Cork Company). "The Reason for the Fuel Saving in the Dressler Kiln," Conrad Dressler (American Dressler Tunnel Kilns, Inc.).

8.00 p.m.—Motion pictures: Great U.S. Chemical Industries. (1) "The Story of Sulfuric Acid" (1 reel), (courtesy General Chemical Company); (2) "The Production of Salt for the Chemical Industry" (1 reel), (courtesy International Salt Company); (3) "Perfumes for the World," (courtesy Antoine, Chiris Company); (4) "A New Chemical Industry: Leather from the Ocean: Fish Leather" (3 reels), (courtesy Ocean Leather Company and Ford Educational Film Company).

Wednesday, September 22.

2.00 p.m.—Industrial Management Symposium. "Ultra Analysis of Costs," Harrington Emerson (The Emerson Engineers). "Research in Industrial Conservation," H. E. Howe, Chairman, Division of Research Extension, National Research Council. "Progress of the American Coal-Tar Industry," Grinnell Jones (U.S. Tariff Commission).

3.00 p.m.—Materials Handling Symposium. Chairman's Address, Roy V. Wright, editor, "Material Handling Cyclopedia." "Material Handling: The Paramount Problem," J. H. Leonard, Editor, "Freight and Terminal Engineering" "Chain Power Transmission," F. G. Anderson (Morse Chain Company). "Steel Collapsible Shipping Containers as Related to the Chemical Industries," Everett W. Morgan (Pneumatic Scale Corporation).

8.00 p.m.—Meeting of Chemical Warfare Post. (Speakers to be announced).

Thursday, September 23.

2.00 p.m.—Chemical Engineering Symposium. (Meeting of the American Institute of Chemical Engineers, David Wesson chairman. "A New Method of Destructive Distillation," Thomas W. Pritchard (Fuel Products Corporation). "Nitration of Hydrocarbons," A. Hough and W. Savage. "Recoverance: A Physical Property in Material and Its Importance," Robert G. Guthrie (Widney Test Laboratories). "Operating Data of a Modern By-Product Coke Oven Plant," C. R. Bellamy. "Canada and the Chemist," C. Price-Green (Canadian National Railways). "Utilization of Peat" (illustrated), B. F. Haanel (Canada Department of Mines). "Corrosion of Iron and Steel as Affecting the Industries," W. D. Richardson (Swift & Company).

6.30 p.m.—Dinner of American Institute of Chemical Engineers at the Technology Club.

8.00 p.m.—Motion pictures: Great U.S. Chemical Industries: (1) "Modern Coke and Gas Manufacture" (3 reels), (courtesy The Koppers Company); (2) "The Story of Petroleum Oil" (3 reels), (courtesy Standard Oil Company of New Jersey); (3) "The Asphalt Paving Industry" (1 reel), (courtesy Barber Asphalt Paving Company); (4) "Colloidal Movement in Asphalt" (1 reel), (courtesy Barber Asphalt Paving Company).

Friday, September 24.

2.00 p.m.—Ceramic Symposium. (Meeting of the American Ceramic Society, R. H. Minton chairman). "A Classification of Sheet Steel Enamels," R. R. Danielson (U.S. Bureau of Standards).

8.00 p.m.—Motion pictures: Mining Industries: (1) "The Story of Coal" (4 reels), (courtesy Sullivan Machinery Company and U.S. Bureau of Mines); (2) "Building, Mining and Quarrying Machinery" (2 reels), (courtesy Sullivan Machinery Company); (3) "Producing Pumps and Engines" (1 reel), (courtesy Midwest Engine Company); (4) "Silver Mining in Ontario" (1 reel); (5) "Gold Mining in Ontario" (1 reel), (courtesy Ontario Department of Mines); (6) "The Manufacture of Pottery" (1 reel), (courtesy American Ceramic Society).

Saturday, September 25.

(Speakers to be announced.)

8.00 p.m.—Motion pictures: (1) "Manufacture of Asbestos" (1 reel); (2) "Silks and Satins" (2 reels); (both by courtesy Bureau of Commercial Economics); (3) "Foamite Firefoam Extinguishing Apparatus at Work" (1 reel), (courtesy Foamite Firefoam Company); (4) "Continuous Motion, Conveying, Stacking, Elevating, Loading and Unloading Machinery" (1 reel), (courtesy Brown Portable Machinery Company); (5) "The U.S. Ammonium Nitrate Plant No. 2 at Muscle Shoals, Alabama" (2 reels), (courtesy Westinghouse-Church-Kerr, Inc.).

PIG IRON PRODUCTION IN CANADA.

The total production of pig-iron in Canada during the first half of 1920, according to statistics collected by the Mines Branch, Ottawa, was 502,667 short tons, of which 499,891 tons were made in blast furnaces, and 2,796 tons in electric furnaces. During the first half of 1919, 524,977 tons were produced. The blast furnace plants active during the first half of the year were those of the Dominion Iron & Steel Co., Sydney, N.S.; Nova Scotia Steel & Coal Co., at North Sydney, N.S.; Algoma Steel Corporation at Sault Ste. Marie, Ont.; Canadian Furnace Co., Port Colborne, Ont.; and the Steel Company of Canada, Hamilton, Ont. The blast furnace plants at Midland, Parry Sound and Deseronto, Ont., were idle throughout the period. Pig iron was made from scrap iron and steel in two plants, the Shawinigan Foundries, Ltd., Shawinigan Falls, Que., and the Hull Iron & Steel Foundries, Ltd., Hull, Que.

FOR SALE.—One thirty-inch square, side-feed, open-delivery, non-washing, recessed type, Filter Press, having thirty chambers with plates recessed to form one inch cake. For particulars apply to The Black Donald Graphite Co., Ltd., Calabogie, Ontario.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

Very few changes in price, but more activity than during the first three weeks of the month mark the chemical market during the last week in August. The usual revival of business following the quiet summer period is taking place and orders are picking up. Caustic soda and bleaching powder are still scarce, but within a few days Canadian dealers expect to have a supply on hand. The coal situation has improved and this accounts for the plants being able to produce both these commodities. Magnesium carbonate is more plentiful and the Canadian natural salt can be obtained at quotations varying from 14 to 18 cents a pound for the light grade. Caustic soda and bleaching powder are still maintaining their high price, due to scarcity. While consumers are expecting lower prices, producers are finding costs mounting which preclude the prospects of any generally lowering of prices this Fall.

Cyanamid.—The annual report of the American Cyanamid Company, Niagara Falls, Ontario, for the year ending June 30, 1920, is a record of progress. On June 30, the company had on hand for delivery during the current fiscal year, contracts for products estimated to have a sales value of $7,000,000. The total sales of the Company for year ending June 30, 1920, totalled $8,684,084, while the net income for the period was $1,525,876, an increase of $477,125. The two new and improved carbide furnaces, of a capacity in excess of eight old furnaces which they replace, were completed during May and have proved very economic and efficient. The company have established a plant at Agusa, Cal., for the manufacture of hydrocyanic acid used for the fumigation of citrus trees. This plant provides an outlet for a considerable part of the cyanide manufactured at the Niagara Falls plant.

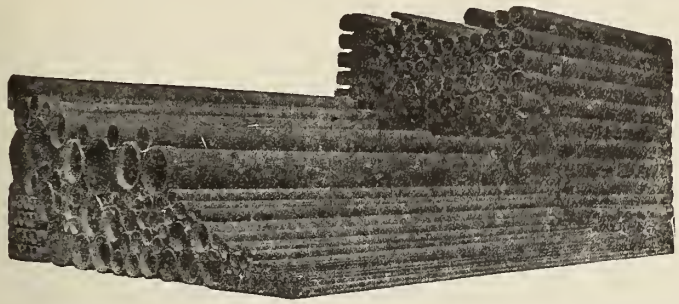
CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	...Lb.	.. — .52
Alum, Ammonia, lump and ground	..100 Lbs	.. — 7.00
Ammonium Bromide	...Lb.	.. — .92
Aluminium Sulphate, high grade, bags	.100 Lbs.	5.75— 6.00
Ammonia, Aqua 26	...Lb.	.10½— .12
Ammonium Carbonate	...Lb.	.18— .19
Ammonium Chloride	...Lb.	.15— .20
Ammonia Iodide	...Lb.	.. — 6.30
Arsenic	...Lb.	.. — .12

The Real Story of Industrial Pittsburgh



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Barium Sulphate (Barytes)	Per Ton	40.00—50.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	4.50— 5.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	45.00—50.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.14— .16
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, drum	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.09¾—.10¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.17— .19
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.14— .18
Magnesium Sulphate	Lb.	.05½—.06½
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—110.00
Mag. Sulphate, B.P., Tanners, car lots	Ton	85.00—90.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .98
Potassium, Bromide, granular	Lb.	.. — .92
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — ..
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash). Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	4.00— 4.50
Sodium, Bichromate, bbls.	Lb.	.40— .45
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.. —.04¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.25— 2.50
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.08¼— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —45.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.06¼— .07
Acetic acid, refined	Lb.	.. — .21
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.35— 1.40
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .80
Formaldehyde	Lb.	.75— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		3.50— 4.50
Oxalic Acid	Lb.	.. — .65
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	.. — 3.00
Quinine	Oz.	.90— 1.00
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid, Triple Pressed	Lb.	.. — .45
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .33
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23¾
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.10¼
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.35— .40
Platinum, pure	Oz.	.. —105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	3.15— 3.50
Tin	Lb.	.56— .58
Zinc, sheets	Lb.	.. —.18½

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .40
Motor Gasoline (service stations)	Gal.	.. — .43
Lighting Gasoline	Gal.	.. — .45
Naphtha	Gal.	.. — .39
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .18
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

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Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
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Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
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Arabic, regular grain No. 4 and No. 5	Lb.	.22
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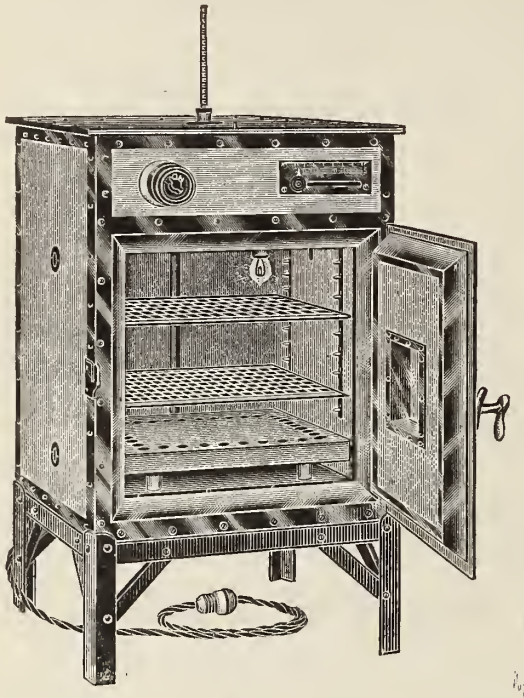

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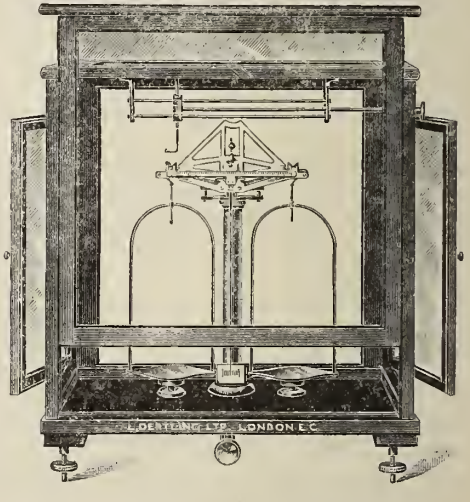

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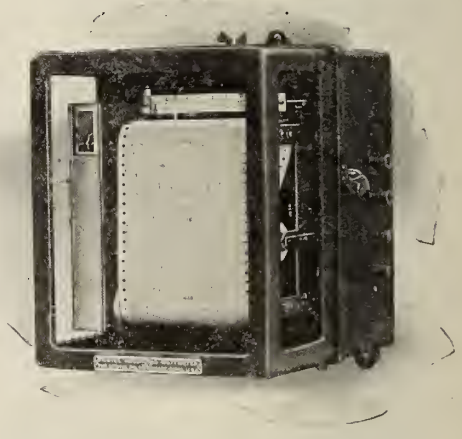

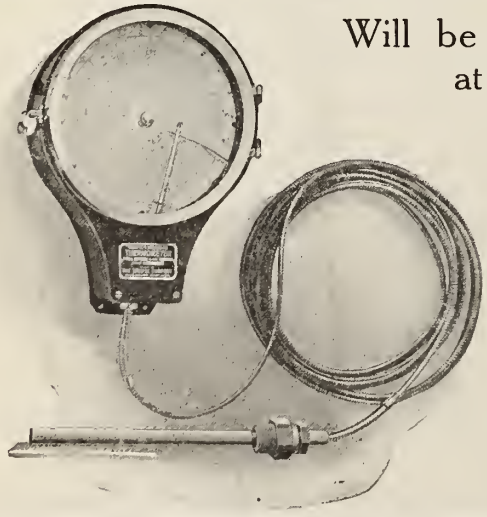

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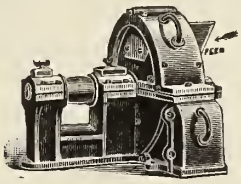

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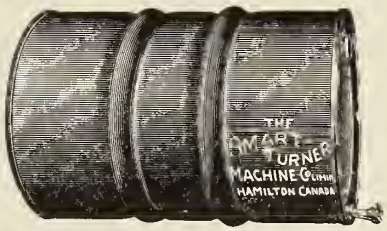

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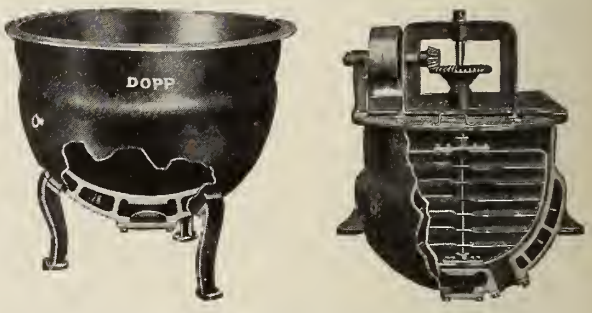

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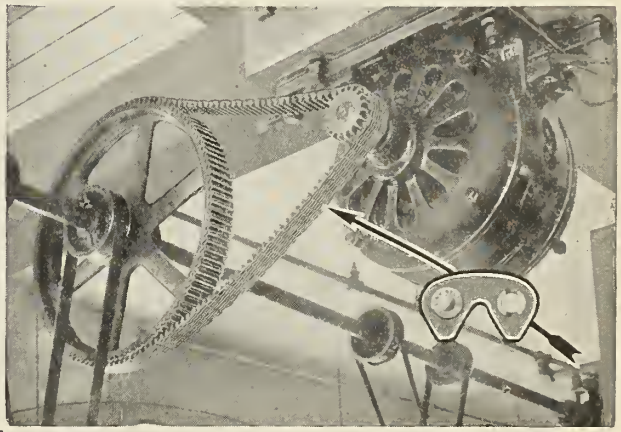

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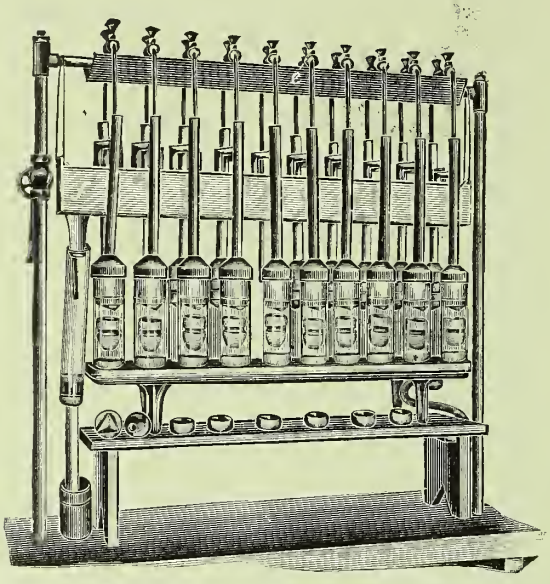

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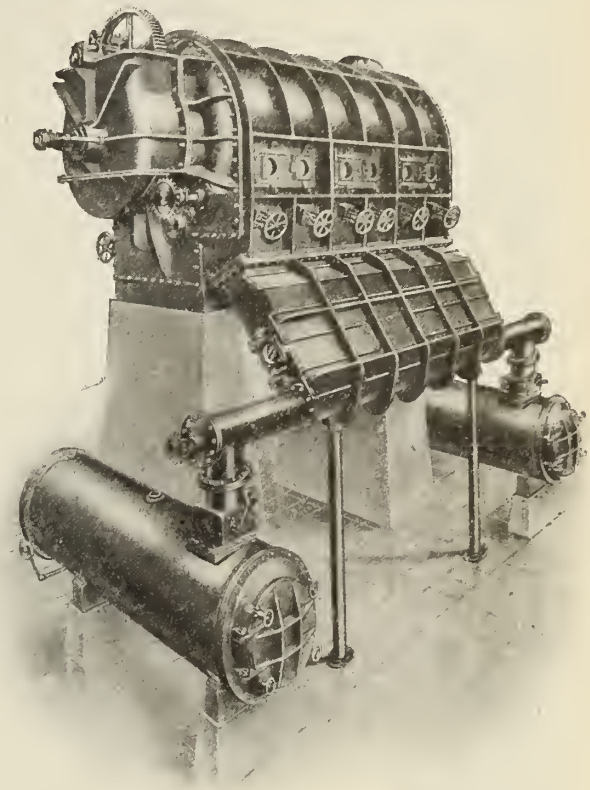

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HEAD OFFICE - MONTREAL CANADA

ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF LANDS, FORESTS & MINES
BUREAU OF MINES

Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Ontario, in 1919, produced 38 per cent. of the total mineral output of Canada.

Summary of Mineral Statistics, 1919.

Product.		Quantity. 1918.	Quantity. 1919.	Value. 1918.	Value. 1919.
Metallic:					
Gold	ounces	411,878	505,963	$8,502,480	$10,451,688
Silver	"	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals	"	.....	1,770	.....	200,000
Copper	lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a)	tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)	"	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)	"	107,273	5,828	624,364	47,591
Iron, pig (c)	"	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic	lbs.	404,348	121,926	887,960	243,554
Cobalt oxide	"	477,583	426,573	727,170	624,553
Nickel oxide	"	406	11,817	106	3,762
Nickel, metalic	"	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds	"	453,515	353,267	73,347	46,711
Other Cobalt compounds	"		66,193		48,230
Lead, pig	"	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates	"	47,614	.....	59,067	.....
Metallic total		.....	.....	66,178,059	41,510,742
Non-Metallic:					
Actinolite	tons	228	160	2,508	1,176
Arsenic, crude and white	lbs.	5,090,818	5,668,170	566,332	485,360
Barite	tons	60	.....	900	.....
Clay products—					
Brick, fancy and pressed	M	25,377	34,934	396,698	631,233
Brick, common	M	49,498	100,095	665,454	1,477,836
Pottery		.....	.....	88,275	114,551
Sewer pipe		.....	.....	362,536	405,413
Tile, drain	M	13,087	11,208	309,899	297,778
Tile, holow building		.....	.....	195,588	166,451
Cement, Portland	bbls.	1,226,244	2,022,575	1,910,839	3,659,720
Corundum	tons	137	.....	26,120	.....
Feldspar	"	19,784	14,319	111,173	86,493
Fluorspar	"	7,286	3,425	153,190	60,039
Graphite, crude and refined	"	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined	"	38,214	59,899	151,564	278,111
Iron pyrites	"	270,966	109,080	1,144,737	267,211
Lime	bush.	2,650,285	3,835,721	872,177	1,235,736
Mica	tons	275	556	49,575	53,247
Mineral Water	Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas	M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat	tons	.....	500	.....	1,750
Petroleum, crude	Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz	tons.	213,420	67,973	452,711	212,329
Salt	"	131,726	148,112	1,287,039	1,395,368
Sand and Gravel	cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick	M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc		.....	.....	869,239	1,068,957
Talc, crude and ground	tons	17,465	17,571	246,691	240,399
Total non-metallic		.....	.....	14,130,913	15,971,371
Add metallic		.....	.....	66,178,059	41,510,742
Grand Total		.....	.....	$80,308,972	$57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

Dividends and Bonuses paid to the end of 1919 amounted to $15,545,238 for gold mining companies, and $78,335,943 for silver mining companies, or a total of $93,881,181.

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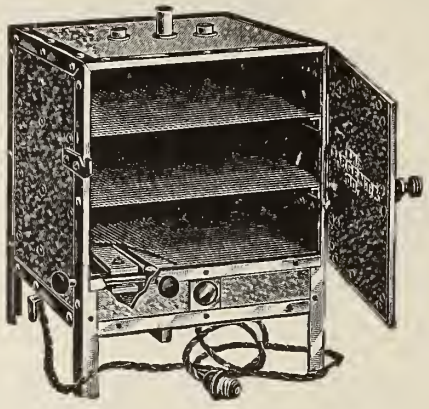

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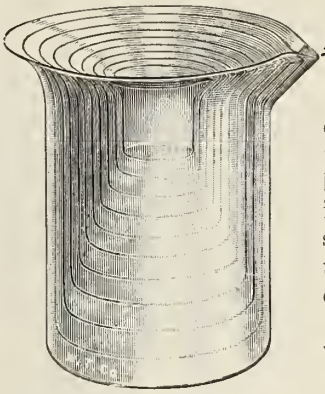

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1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form with lip—	Regular Price.	Sale Price.
60 cc.	$2.00 dozen	$1.40 dozen
120 cc.	2.35 dozen	1.55 dozen
180 cc.	2.50 dozen	1.65 dozen
1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form without lip—	Regular Price.	Sale Price.
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700 cc.	5.00 dozen	3.25 dozen
Flasks, Erlenmeyer (Conical) narrow mouth—		
	Regular Price.	Sale Price.
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700 cc.	4.20 dozen	2.75 dozen
1000 cc.	5.00 dozen	3.25 dozen
2000 cc.	10.00 dozen	6.50 dozen
Flasks, Flat bottom, vial mouth, globular—	Regular Price.	Sale Price.
180 cc.	$2.35 dozen	$1.55 dozen
1000 cc.	4.65 dozen	3.00 dozen
2000 cc.	10.00 dozen	7.50 dozen
4000 cc.	16.60 dozen	10.50 dozen
Flasks, Flat bottom, heavy ring neck, globular—		
	Regular Price.	Sale Price.
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500 cc.	3.80 dozen	2.50 dozen
700 cc.	4.25 dozen	2.75 dozen
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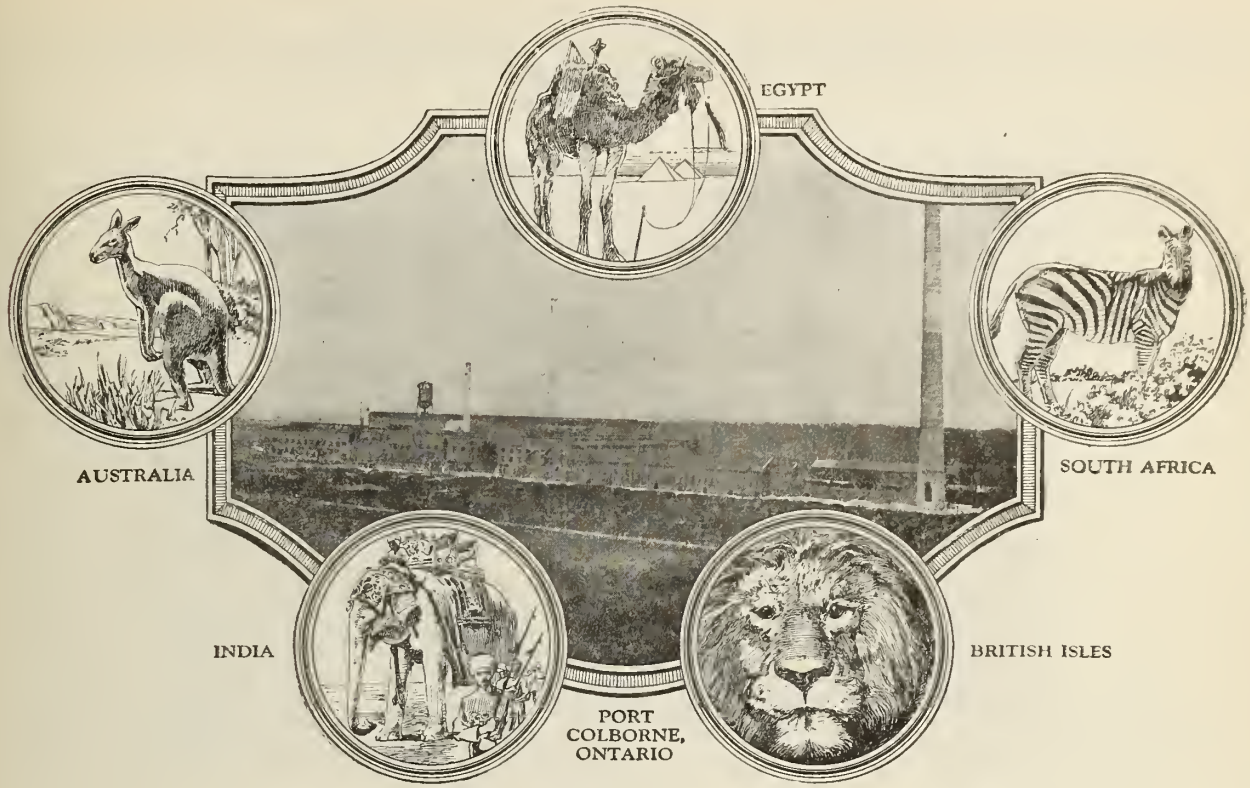

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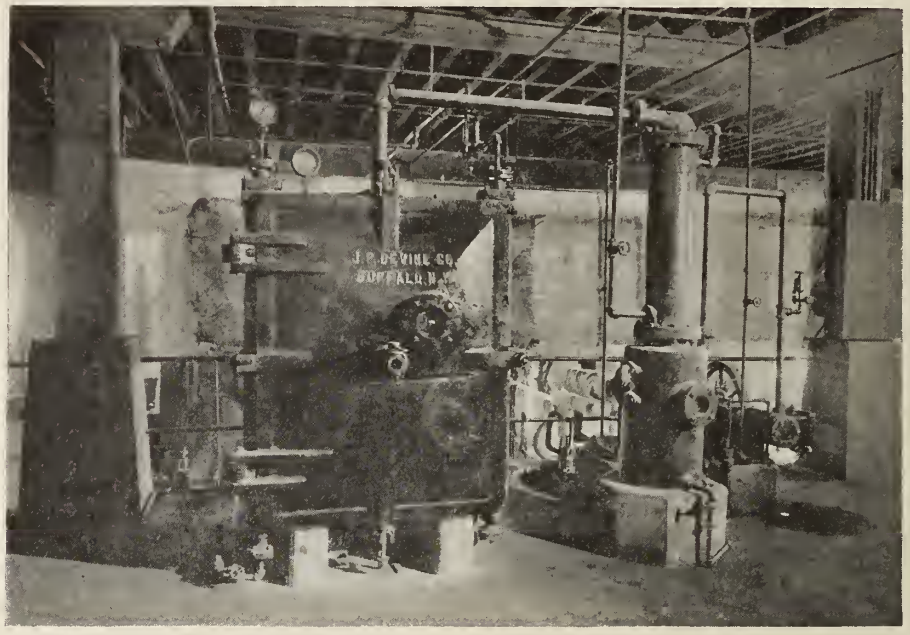

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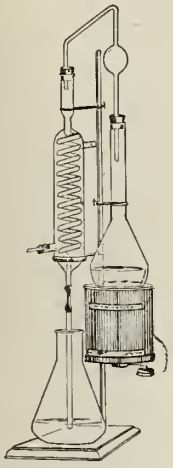

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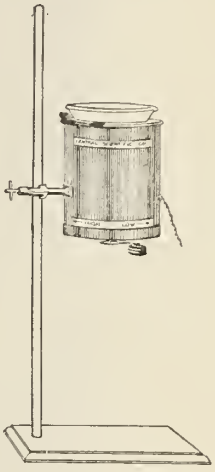

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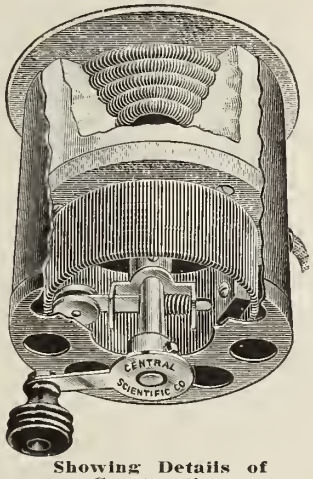

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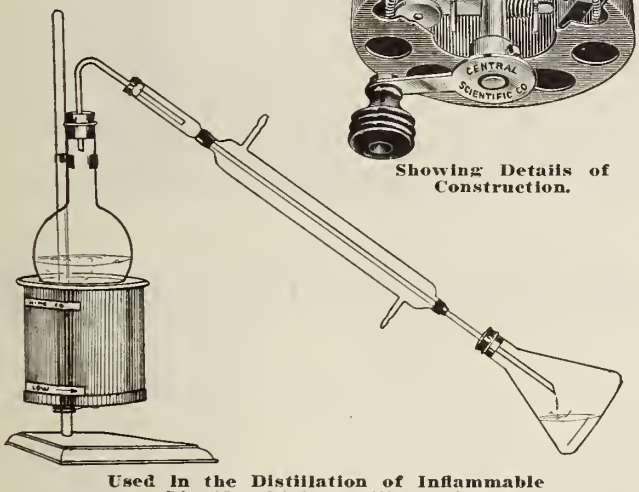

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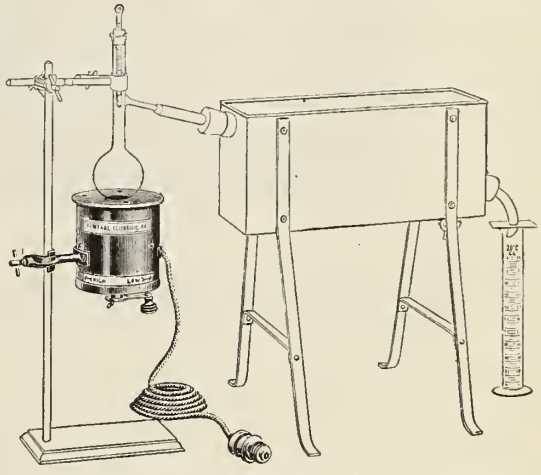

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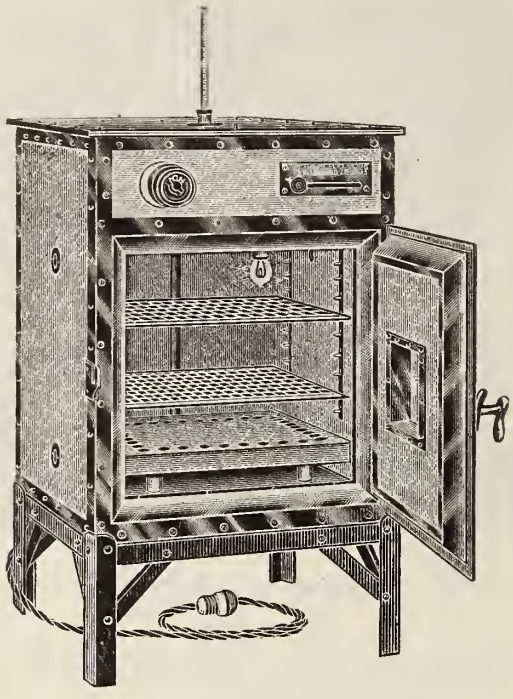

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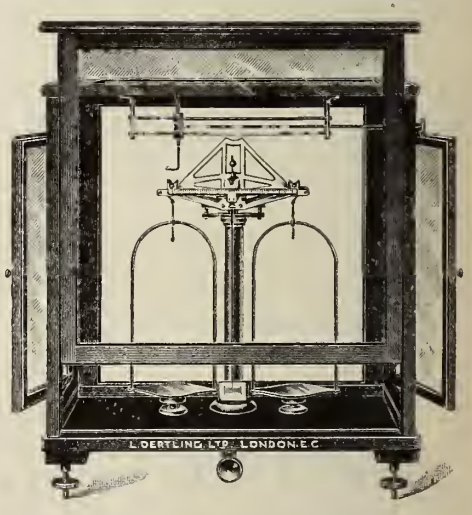

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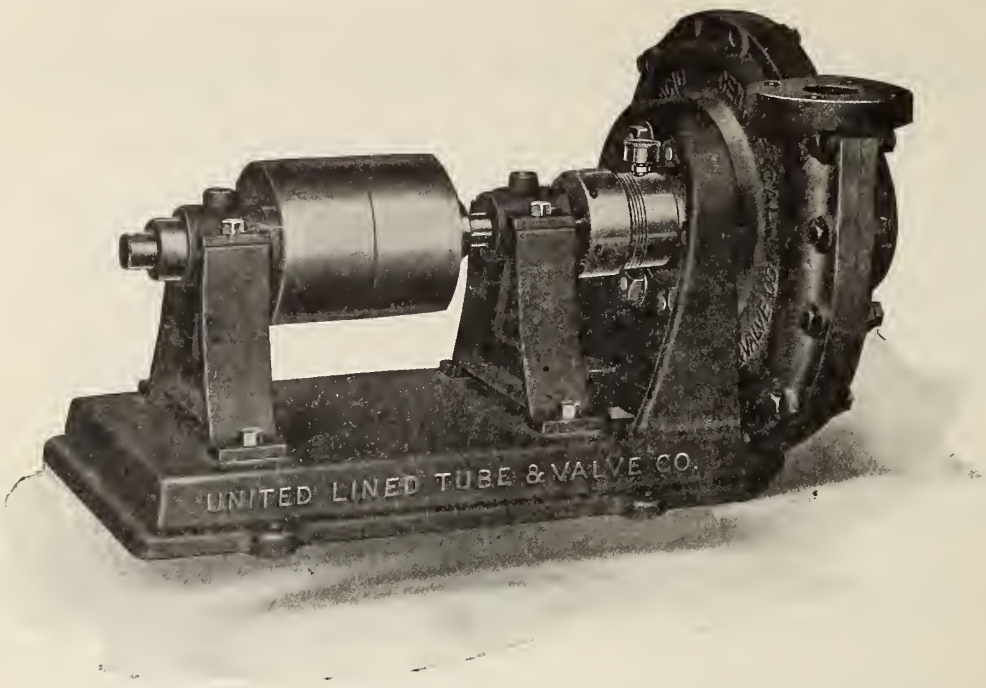

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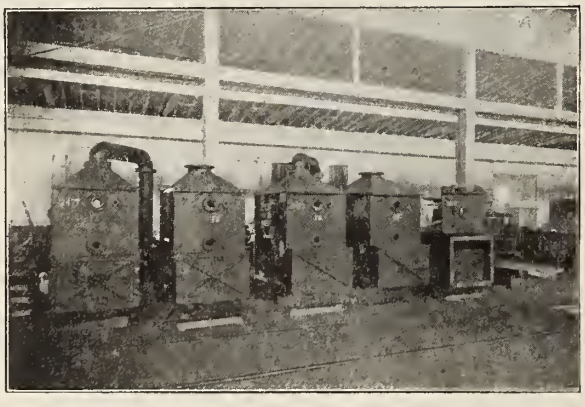

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A Canadian Journal devoted to Metallurgy Electro-Chemistry and Industrial Chemistry.

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 4 TORONTO, OCTOBER, 1920 No. 10

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EDITORIALS

RAILROADS AND TARIFFS.

TWO interesting developments of our domestic and national life merit some consideration. One is now in the condition of advantage known as a "fait accompli." The other is still subjudice.

Railway rates, both passenger and freight, have been boosted—raised is mild—twenty per cent. in one case, to a limit of forty per cent. in the other.

What are the claimed urgencies to meet which the people of Canada have been asked—nay, not asked, but commanded—to "contribute cheerfully?" It is adopting a somewhat demiurgeous attitude to prefer a "cheerful giver." It is easier if the oyster doesn't weep.

We are advised that one railroad could make out fairly well. We were not expected to have an extremely generous attitude towards that road, but we own another ourselves which is likely to be in parlous condition as to deficit, which we expect and are always prepared to hear about. Now, to reduce this deficit, its income must be raised, but here's the quandary: income on one of two competing systems cannot be increased by raising rates on one and not the other, so rather than find a source of revenue to replace the deficit on one system, the country is asked to imburse both. The urge behind the railway increase is the higher percentage of total earnings going to wages of employees. There are few classes who get what they want when they want it, as well as employees of transportation companies. Perhaps they are not over-paid—perhaps nothing is wrong, but for a change let us all turn and roll the other way. Public ownership and private investment do not mix well in this case, and in the protection of private funds the public may be called upon to pay more than its due. If the bill must be paid, the cash plan adopted is desirable.

The second matter, still subjudice and likely to be subjudice for a number of moons, is the tariff committee or commission. There seems some doubt as to its actual status, but it is out to get the views of the people. Personally, we believe the tariff should be out of politics, that a small body of men should be charged with the revision of tariffs to meet exigencies as they arise and to base the tariff on the best interests of the people. The manufacturers should be protected to a sufficient extent to ensure a good home market, but not so that the home market has to take what they give it or go without. Should protection eliminate the necessity for scientific advance and control and tend to make antiquated or inefficient methods of doing business pay dividends, it would be economically false.

We do not think that any one is protected in the payment of duties on articles not made or likely to be made in Canada. Hay-scales and trucks are made in Canada. Laboratory balances are not. It does not seem fair for that reason to class laboratory balances with hay-scales in the tariff, as they are at present. It is one thing to protect present Canadian industries, but it does not follow that an industry should be protected a generation before it exists.

The appointment of a permanent tariff board should operate to correct anomalies and grant a flexible measure of protection.

There is one great and imperative consideration whatever we do. The exhaustible resources of the nation must not be exploited for the benefit of any private interests. Our indigenous industries should be encouraged, not for the purpose of paying dividends on inefficient operations, but with a sense of responsibility to the nation. We should aim to increase the labor value of our exports, placing no limit on the public money properly spent on economic and industrial scientific development.

This cannot be done by the appointees of a party, but by the servants of the nation. The tariff board should be so constituted that its permanence is secured by some automatic function of several independent organizations, as for instance one man appointed by the Canadian Bar Association, one appointed by the Canadian Manufacturers' Association, one by the representative agricultural body, one by the Trades and Labor Congress of Canada, and one by the scientific bodies, with terms of office so arranged that the policies of the board will suffer no sudden dislocation. We believe some such board would act for the general welfare in a distinctly new sense.

CHEMICAL EXPOSITIONS.

WE are in the position where we must report in this issue two chemical expositions. Naturally the Chemical Exposition just closed in New York stands out as the dominant indicator of the progress of chemistry in America. It should be remembered that a very few years ago it it was a small idea backed up by some very progressive individuals. Even now some people wonder why they are there, but when considerations for the future are being made, they rediscover their enthusiasm. The Chemical Exposition in New York

has become part of the life of the industry and is now as essential as manufacturing itself.

Those companies who co-operated to make the Chemical Section at the Canadian National Exposition a success were pioneers. They were exhibiting before both the trade and the public, and had a double duty to perform. Their spaces were small, because the available buildings have long since been seized upon by older industries. It is safe to say that with encouragement the chemical, metallurgical and allied industries of Canada could, next year, fill a very respectable building, if such were available. If similar or more specialized industries from England and the United States were invited to show goods, a group could be gathered which would at least equal the first Chemical Exposition held in New York.

Growth in the number of exhibitors and a more elaborate showing of dyestuff industries in the United States were the features of the past Exposition. Grand Central Palace has become too small and now a large armories in the Bronx has been chosen for another time. The interest in Canada was very keen, and all those from the Dominion were kept busy answering enquiries. By moving pictures, addresses, and exhibits the resources of the country were brought to the attention of visitors.

That which has developed to such proportions in the United States and has been found a valuable work, may be done in a slightly different way in Canada, if those concerned will but make the effort. Let us not visit expositions in foreign countries, or in other parts of the Empire, only to come back to say how impossible it is for us ever to reach that stage. Rather let us return enthused with the idea and the ideal that we in Canada have resources which, unless we treat them like fools, will allow us to attain in a reasonably short time a very secure position for our country in all matters of trade and applied science.

ISOLATION OR ORGANIZATION.

MR. LLOYD GEORGE recently told a labor delegation that his government willingly recognized trades unions and would be glad to deal with labor as represented by duly qualified delegates of trade unionism. We believe that is sound policy. We may not be enthusiastic about collective bargaining as applied to industry, believing that an employer can deal with his own employees quite satisfactorily without being required to deal with outsiders engaged in other trades or no trades. That is all just now on that point, but we wonder if there may not come a time when the professional and technical men and women of this country will wish to be heard for the national welfare. Any one of us can go to Ottawa, with patience, and within the allotted span of life, possibly reach a heavily furnished room and talk for a few moments to an important man. That is quite one of our rights in a democracy. Little other than a sense of pleasant personal courtesy will result unless we can say that we represent the united suggestion or request of some respectably large organization. This country needs in its public life such assistance as its professional men can give, not as mere electors, but as having a special knowledge of subjects vital to the national interest.

Three organizations are endeavoring to embody the scientific technical men of Canada. The Society of Chemical Industry, The Canadian Institute of Chemistry, and The Engineering Institute of Canada. In one, at least, of these bodies, all chemists, engineers, chemical engineers or men interested in the application of chemistry and engineering, should be found.

They are not bodies of cloistered bookworms, but are live, up-to-date organizations with active pulses and in touch with progress. Membership in one class or another in all three is open to men of knowledge and experience.

Their journals are well printed and full of the information you need. They need your help in the work they are doing and you need their help in the work you are doing.

The Society of Chemical Industry needs business men and all chemists, including students, who are interested in the development of industries and the furthering of business interests. New sections, in particular, need support. The Canadian Institute of Chemistry needs associate members, and there are still many who might become Fellows. All those qualified should associate themselves with the Chemical Engineering Section of the Engineering Institute.

Join up and become an entity in the professional world.

SOCIETY PROPOSALS FOR 1921.

IF the plans now being considered by officers of the Society of Chemical Industry in England, the United States, and Canada, and officers of other chemical organizations are adopted, it is very probable that a series of joint meetings will result in Canada and the United States during September of next year.

Nothing could be more desired than such an opportunity to co-operate for the general good of the Anglo-Saxon peoples, and the professional and business chemical interests of all concerned. Future announcements of the progress of these plans will be followed with interest.

FIGHTING WRONG OR CROWNING RIGHT?

WHEN King David was dying news was brought to him of the attempted usurpation of the throne by his son Adoniram. Without hesitation he proclaimed Solomon king. Only two men were charged with the duty, but they were well qualified. The sounds of acclamation were heard by the usurpers and they broke for the woods. There are other details not relevant just now.

Recently we had the privilege of listening to President Durkee, of Howard University, Washington. His text was the incident referred to above. His application was that when Right was crowned, Wrong was defeated. We recognize that this is an editorial chair and not a pulpit, but we feel that more people should consider that postulate. If David had sent for his counsellors there would have been a conference at the palace in the morning, an adjournment to the tabernacle at noon, followed by smaller conferences of the military authorities and the priests, and meantime the usurpers might have overturned the kingdom.

In Eastern Europe news advices recently informed us that the victorious soviet forces were within sixty miles of Warsaw and that any allied decision to deal with them could only be formulated after a conference which must wait for a week for the presence of one man. Something related to that came into our mind while we sat under the pines that quiet August Sunday by the sea. It was this. The need for stronger, purer, truer citizenship is great. The principle and practice of citizenship are simple, so simple that a child has been declared its best exponent. We are told, however, that there is need of special university courses in citizenship, that no move can be made until a few determined adolescent Solons have put in a special course of training. This is wrong. The *thing* that is at the gate now, may get in while G.H.Q. is looking up that half case of plum and apple. Initiative and self abnegating loyalty are called for now, not in the mass, but the individual. We are all engaged in the pursuit of happiness, it is one of those rights said to be "inalienable." If our neighbor gets drunk, throws his furniture about, maltreats his family, we would not add either to his happiness, their happiness or our own by knocking him on the head, which he might verily deserve. We can see to it that our personal, possibly harmless, predilections do not provide a market or excuse for anything that will bring little ones to a heritage of shameful treatment, slum life and disease. We can see to it that no recognition of red light districts be considered, and that such as live in any way on the weaknesses and vices of others get no excuse for their trade in any practice of ours, however selfishly we can say it doesn't hurt *me*. The successful community will never be that wherein *I* insist on *my* rights, but where I insist on my neighbor's rights.

In crowning the right, there is no need to wait for the Royal Society of Wiseacres to define it, or for a committee to prepare a constitution and set of by-laws for it. We know it.

One who could always put truth in few words said: "If ye know these things, happy are ye if ye do them."

It is part of the business of the chemists of Canada to combat those forces which are seeking throughout the world to throw down law and order. We may differ as to certain views, but there are, unfortunately, many who are not sufficiently interested to seek a view point based on correct information. We, therefore, make no apology for these remarks. The technologist, chemist, and engineer must take a large part in community affairs, and can only do so when well informed and actively interested.

EXTRAVAGANCE.

WHEN we were of years, generally described as tender, a little rhyme was quoted to us so frequently, that we recall it readily in spite of rebellion at the refectorial drudgery it entailed. It concluded thus after application in the first person singular—

> For wilful waste makes woeful want,
> And I may live to say:
> I wish I had that crust of bread
> That once I threw away.

Figures for the four months from April 1st show that we imported four dollars' worth of material for every three dollars' worth exported. It is impossible to improve our credit while sending out thirty per cent. more than we take in.

There are few necessary things that cannot be made in Canada and to make those few we only need a small importation of raw material. It is a strange commentary, therefore, on our loyalty, that we should buy so much outside of Canada that our credit is stretched unduly. It is strange, indeed, that people should seem so unsatisfied with that which is not imported.

Have we, as individuals, an inordinate desire for the flesh pots, the garlic, leeks, grape fruit and motor cars of Egypt?

Do we, as manufacturers, consider that protection is applied to enable us to make profits on inefficiency, or that our customers should buy goods whether they like them or not, simply because they are made in Canada?

Do we, as workers, spend so much time in play that we cannot make three million square miles of

land that flows with milk and honey support seven million people?

Oddly enough we are asked to throw up our hats in joy because of a large revenue from customs, by the same people who are supposed to be specialists in protecting our industries from the competition that produces the said customs revenue.

Our industries must be protected; that goes without saying, especially those that develop our natural resources. But after all, quality and service are industry's best protectors. Let the service be mutual, capital, labor and consumer. There is a tendency to overload the last. He, being, at present, somewhat in funds, is buying in the market that suits him best personally.

The best of good roads to prosperity is the pathway that the world wears to the door of the man who makes the best, whether mouse-traps or motors.

TRUTH.

DOWN at the bottom of the well? When a bucket is let down for a draft of that precious freedom-producing fluid, behold, all that comes up is a pailful of propaganda. Propaganda is the modern substitute for truth. There is a misdemeanor in law termed "fabrication of evidence." Propaganda is a kid glove term for the same process.

Propaganda is used to bring about pogroms in Poland and Russia, or to induce people in Canada to buy at high prices before a boom breaks. It is a form of verbal camouflage that should lead to the closest examination of all news items, and especially of the kindly informative article that purports to tell careful people a "really good" article can be had at such a place for fifteen dollars, seeking to cover up the fact that an article, same style and service value, can be had for nine or ten dollars by anyone who cares to look for it.

FELDSPAR PROPERTIES PURCHASED.

Three feldspar properties in Hyla, Haliburton County, Ontario, have been purchased by American Molybdenite Limited. It is stated that contracts have been entered into with an Ohio manufacturer of sanitary enamelware, calling for the delivery of one car of feldspar per day, averaging 35 tons. New England feldspar deposits previously used, are now said to be exhausted.

BRUNNER, MOND SECURE NITROGEN MANUFACTURE FROM GOVERNMENT.

A company has been formed by Bruner, Mond and Company, of London, England, to take over from the British Government the manufacture of nitrogen from the air. The company is to be known as Synthetic Ammonia and Nitrates, Limited. Initial steps in the building of a plant were taken by the Government at Billingham, Durham, in 1917 and 1918, but operations were suspended after the armistice. It was finally decided to have the enterprise carried on by private capital and Brunner, Mond, organized the new company, capitalized at $25,000,000.

A TRIBUTE TO THE LATE DR. WILLIAM HODGSON ELLIS.

By JAMES WATSON BAIN.

On August 23, 1920, the University of Toronto suffered a severe loss through the death of its distinguished alumnus, William Hodgson Ellis, LL.D., M.A., M.B., Professor Emeritus of Applied Chemistry and Dean of the Faculty of Applied Science and Engineering from 1914 to 1919.

Dr. Ellis was born in Derbyshire, England, in 1845, and during early boyhood his father emigrated to America and settled in Illinois. To this circumstance, Dr. Ellis owed an experience quite unusual among his Canadian contemporaries, for he could recall clearly listening to one of Abraham Lincoln's campaign speeches, which made a profound impression on his youthful mind. After a few years in the United States, the family moved to Toronto, where Dr. Ellis pursued his studies at the University, graduating first in Arts and then in Medicine.

The Professor of Chemistry in the University at that time was Henry Croft, a man of singularly attractive personality, and an excellent teacher. Largely owing to his enthusiasm, Dr. Ellis became his assistant instead of following the profession of medicine, and after a brief period undertook the additional duty of teaching chemistry in the newly-founded School of Technology, which had been formed to supplement and supersede the older Mechanic's Institute.

When the School of Practical Science was instituted, in 1877, to provide for the training of engineers, Dr. Ellis became the Assistant Professor of Chemistry, and shortly afterwards Professor of Applied Chemistry, a title which he retained to the last. In the medical faculty, Dr. Ellis was for many years professor of toxicology and medical jurisprudence, in which fields he had a very wide experience. In addition, Dr. Ellis lectured to students in the faculties of Arts and Forestry on Applied Chemistry, with the result that he was well known to many graduates in the faculties other than that of Applied Science.

In the midst of his university activities, Dr. Ellis found time to act as a Public Analyst for the Inland Revenue Department of the Federal Government, and the experience thus gained gave to his lectures and laboratory instruction that touch of reality which is so potent an agent in arousing and retaining the interest of students.

During the years of his professional activity, he was engaged in practically every criminal case in Ontario where expert testimony in medical jurisprudence was necessary. This brought him into contact with the leaders of the legal profession and widened his already large circle of friends. No other circumstances threw into more prominent relief his outstanding qualities than the investigation of some suspected case of poisoning. No pains were too great, no precaution was too trivial to be neglected when the laboratory examination was under way, and in the witness box his evidence was so clear, direct and unmistakable that it was never shaken by counsel.

In the course of his long career, Dr. Ellis was called upon to give advice upon a great variety of matters involving considerations of chemistry, and each of these received a careful and thorough study before an opinion was issued. Long after the matter appeared, in the minds of his assistants, to be definitely settled by laboratory evidence, Dr. Ellis pursued every cross trail until he had thoroughly convinced himself that it lead nowhere, which

illustrates the dislike of hasty judgments, which was one of his well-known characteristics.

In 1914, the first Dean of the Faculty of Applied Science, Dr. John Galbraith, died, and at the request of the President, Dr. Ellis became his successor, although he had already made application to be relieved of duty on account of age. The situation was peculiarly difficult. The former Dean had spent time and energy unsparingly in promoting the interests of the "School," added to which his personal qualities had won for him a host of friends; the war had begun to drain the students from the University, which created new and difficult situations; and there was an insistent call for progress and leadership along new lines of work. It was almost too much to expect from a man of 69, but Dr. Ellis shouldered the load cheerfully, maintained the reputation of the Dean for the prompt dispatch of business, guided the Faculty in the perplexing questions of student life under war conditions, and initiated among other things the School of Engineering Research, which has abundantly justified his foresight and energy.

Honors, academic and professional, came to him in abundance. He received the honorary degree, LL.D., from both his Alma Mater and from McGill; he served as President of the Canadian Institute and as Chairman of the Canadian Section of the Society of Chemical Industry. Shortly before he retired, a dinner was given in his honor at the York Club, and a sheaf of congratulatory telegrams from friends and old students from all over North America was the feature of the evening. Dr. W. Lash Miller celebrated the occasion with a Latin ode, and not to be outdone, Dr. Ellis produced a translation, both of which are given below:

Aquis innocuis, herbae favillis,
Honorat facultas decanum Ellis,
Subito, dum manducant diligenter,
Tempus et spatium semiel delentur.
Fulguris impetu veniunt Voces
Oceano utroque volant veloces
Clare clamantibus canitur illis carmen epulare
"Venerant filii te, Doctor Ellis!"

Banquet Song.

With ginger ale and glowing weed
To toast the Dean the School agreed,
They still were busy masticating
When time and space annihilating
From every quarter of the nation
A chorus of congratulation
Came sudden as the lightning's shock.
"What is the matter with the Doc?"
The answer flashed from either sea,
"Oh! he's all right." "Who says so?" "We!"
"And who are we?" "Why can't you guess?"
"His children of the S. P. S.!"

Dr. Ellis was passionately fond of outdoor life and had a wide and intimate knowledge of natural history. While at the University, he visited the Muskoka district, at that time an almost virgin forestland, and having once experienced the charm of the North country, every succeeding summer found his canoe in some part of that noble heritage of the Canadian. He was an ardent fisherman, and took the keenest interest in all the intricacies of the art as practised by Izaak Walton and his disciples; indeed, the Compleat Angler was his familiar companion, from which he could quote at will. The scientific bent of his mind was displayed in this connection in the establishment of an empirical rule by which the weight of a black bass could be deduced by its length, a result obtained graphically from specimens which he himself had caught. On May 1st of each year, Dr. Ellis was not to be found by those who sought his professional services, but the initiated were perfectly aware of the fact that he could be discovered in a boat or canoe, trying a new fly on the trout. It was quite natural, therefore, that he visited such famous fishing grounds as the Nipigon River, the north shore of Lake Superior, the Temagami district and many others, long years in advance of the ordinary tourist, and his recollections of these expeditions interested and entertained his friends on many occasions. That the call came to him at last among the woods and waters which he loved so well has appeared to his many friends as particularly appropriate.

Dr. Ellis was very fond of golf and played at the Toronto Golf Club for many years. He further endeared himself to many of his friends by cheerfully enduring their efforts to learn the game or to attain some proficiency in it. One man was heard to remark, after a round, that only a golfer of unlimited forbearance and sympathy, such as Dr. Ellis, could have watched the novice's play without picking up his ball and going home in disgust.

To be a poet, also, was Dr. Ellis' good fortune, and from his pen we have some delightful accounts of incidents usually drawn from outdoor life. Some of his friends collected these poems and published them privately under the title, "Wayside Weeds," a modest book which is carefully treasured by those who loved the author. That Dr. Ellis could sketch excellently and had a talent for extemporizing rapidly with pen or crayon is well known to all the members of the staff of the university, whose annual dinners were enlivened by a series of drawings executed while the artist made a running explanation. These were always novel and invariably humorous; usually some well known topic of the day was treated in inimitable fashion. The flavor of Dr. Ellis' humor may perhaps be best described by drawing a parallel with Lewis Carroll, and had he found time to do so, he might have enriched our literature with a second Alice in Wonderland.

To set down adequately in black and white an account of those traits of character which made Dr. Ellis so much admired and beloved by his friends is quite beyond the power of the present writer, and a few words must suffice. The kindness and sympathy which never failed remain an undying memory to those who knew him, but no mere amiability prevented him from taking a strong stand, cost what it might.

In one of the difficult situations which arose during the war, he alone was serene and undisturbed among the turmoil which threatened to bring about an ugly crisis. To meet Dr. Ellis was to carry away the impression of a man with whom one could sit on a log, smoking, and discuss almost any subject whatever; and this capacity for companionship without ceremony was an open sesame to the hearts of nearly every one he met.

During the Fenian Raid, Dr. Ellis went to the Niagara frontier as a member of the University Company, and had the misfortune to be taken prisoner. In later years, he frequently referred to his military experiences with an affectionate touch, which justifies us in quoting from The Happy Warrior some lines which describe, with all the aptitude possible in language, the character of him who

was recognized not only as the head of his profession in Canada, but also as one of its most powerful influences for good:

"Whose high endeavors are an inward light,
That makes the path before him always bright:
Who, with a natural instinct to discern
What knowledge can perform, is diligent to learn;
Abides by this resolve, and stops not there,
But makes his moral being his prime care;
. . . . . .
He fixes good on good alone, and owes
To virtue every triumph that he knows:
—Who, if he rise to station of command,
Rises by open means; and there will stand
On honorable terms, or else retire,
And in himself possess his own desire;
And therefore does not stoop, nor lie in wait
For wealth, or honors, or for worldly state;
Whom they must follow; on whose head must fall
Like showers of manna if they come at all;
Whose powers shed round him in the common strife
Or mild concerns of ordinary life,
A constant influence, a peculiar grace;
But who, if he be called upon to face
Some awful moment to which Heaven had joined
Great issues, good or bad for human kind,
Is happy as a lover; and attired
With sudden brightness, like a man inspired;
And through the heat of conflict, keep the law
In calmness made, and sees what he foresaw,
Or is an unexpected call success,
Come when it will, is equal to the need.
. . . . . .
Who, with a toward or untoward lot,
Prosperous or adverse, to his wish or not,
Plays, in the many games of life, that one
Where what he most doth value must be won:
Whom neither shape of danger can dismay,
Nor thought of tender happiness betray;
Who, not content that former worth stand fast,
Looks forward, persevering to the last,
From well to better, daily self-surpast."

OFFICERS OF CANADIAN INSTITUTE OF CHEMISTRY, 1920-21.

In the September issue the Members of Council for 1920-21 were reported. The officers for the year are listed below. It should be noted that both the past President, Prof. J. W. Bain, and the Secretary-Treasurer, Harold J. Roast, have been chosen to continue their work for a second term. The members of the Institute have been rendered a very great service by their efforts, and it was unanimously felt that continuation in their offices was most essential to the immediate progress of the Institute.

President—Professor J. Watson Bain, University of Toronto, Toronto, Ont.

Secretary-Treasurer—Harold J. Roast, F.C.S., 393 Guy street, Montreal, Que.

Vice-Presidents—Dr. Harold E. Bigelow, Mount Allison University, Sackville, N.B.; Professor W. Lash-Miller, University of Toronto, Toronto; Dr. George Baril, M.D., Universite de Montreal, Montreal, Que.

Members of Council—E. G. R. Ardagh, B.A.Sc., University of Toronto; Leonard T. Acton, M.A., 494 Summerhill avenue, Toronto; Dr. J. S. Bates, Price Bros. & Co., Ltd., Kenogami, P.Q.; S. J. Cook, A.I.C., Dominion Bureau of Statistics, Ottawa, Ont.; J. A. Dawson, Department of Health, Vancouver, B.C.; Professor A. Lehmann, University of Alberta, Edmonton, Alta.; Dr. R. D. McLaurin, Wm. Davies Co., Ltd., Toronto, Ont.; I. C. Mackie, B.A., Dominion Iron & Steel Co., Sydney, N.S.; Professor Matthew A. Parker, University of Manitoba, Winnipeg, Man.; Dr. R. F. Ruttan, McGill University, Montreal, Que.; L. E. Westman, A.I.C., Canadian Chemical Journal, Toronto, Ont.

NATURAL GAS INQUIRY, 1920.

The Ontario Department of Mines has recently issued Part V. of their 29th Annual Report, giving the findings of the Commission appointed in February, 1920, concerning the natural gas shortage in Ontario. Mr. E. S. Estlin was the Commissioner appointed, and all inquiries were held under the Public Inquiries Act, and the evidence taken under oath. During the course of these hearings, which were held at Sarnia, Windsor, Chatham and Woodstock, 102 witnesses were examined and a large amount of valuable evidence procured. The evidence shows that there is a serious shortage of natural gas in Ontario, and that the present available supply of gas is not adequate, under the present conditions of market and consumption, to supply the wants or the people in large centres. The chief reason given for the shortage is the decline of the gas fields and the small area of new producing territory explored.

It was brought out that it is clearly in the interest of the consuming public that independent exploration work be encouraged, and that where small fields are opened (at considerable distance from market, but within reach of existing pipe-lines) some method should be found so that present pipe-lines become the carriers of such gas under circumstances encouraging to the operators of the newly opened small field. Though the gross revenue derived from the operations of the gas fields is not sufficient to meet ordinary expenses, and to make reasonable returns to investors, the production and sale of natural gas could continue, were companies permitted to sell to industries in the summer, when the domestic sale is at a minimum.

In the summary of the evidence taken, the Report states: "If a general readjustment in the whole situation does not take place immediately, the business will pass into decline, and this valuable fuel supply will be lost to about 15 per cent. of the population of the province."

THE FERTILIZER INDUSTRY AND CHEMISTRY.

It is not necessary to discuss the place of the chemist in the fertilizer industry. There was a time when materials were sold as fertilizers without an exact knowledge of their chemical content, but that time is happily past. The State control sees to it that the fertilizer manufacturer knows what his goods contain.

The increasing use of waste materials in the manufacture of fertilizers has been made possible by the more general employment of chemists at the factories. More efficient processes have been devised, and a more uniform product obtained, under the supervision of men trained in the principles of chemistry. The manufacturing standards of the industry have thus been raised, with a resulting approval of the various State officials, and a growing confidence on the part of the users of fertilizers.—*The American Fertilizer.*

The Industrial Chemical Section at the C.N.E.

The First Industrial Chemical Section at the Canadian National Exhibition was a Success and Showed what Splendid Possibilities there are for Greater Things.

A START was made at the 1920 Exhibition, Toronto, which would seem to warrant those exhibiting in the Chemical Section in looking forward to a bigger effort on future occasions.

The twelve exhibits were placed in the northeast corner of the Process Building. The Exhibition authorities were faced with the general problem of housing all those who desired to exhibit. While the space available to the Chemical Section was small and not the best location on the grounds, the attention of a large number was directed to the exhibit.

The Society of Chemical Industry had desk space in the booth of Watson, Jack & Co., and welcomed visiting chemists to this new section.

When the exhibit is taken as a whole, it will be seen that practically all the main branches of applied chemistry were represented. A number of exhibits of chemicals or closely allied products were scattered throughout other buildings, and if these had all been joined up with the Chemical Section proper, a better display, as far as numbers are concerned, would have resulted.

The general opinion expressed by exhibitors was one of satisfaction with the results obtained.

If the Canadian National Exhibition is to expand to still greater things, it must begin to adopt a better classification of exhibits. The old names—Manufacturing, Industrial and Process—are too broad. It would seem better to advance the idea of selective allied groups. This has been done in part, but the work can be still further developed.

The chemical industries being new have to struggle with the public for attention and with other exhibitors for space. If given space they stand a very fair chance of receiving attention. The experiment of injecting a chemical section into the Exhibition was well worth while, and is probably only the beginning of something which some day may occupy a whole building. The idea is worthy of the support given to it by the Society of Chemical Industry, and beyond that should receive all the assistance possible from the individuals who represent the industries concerned. In no other country in the world is there such an opportunity of reaching practically one-tenth of the total population along with such a high percentage of foreign visitors.

COMPANIES REPRESENTED IN THE CHEMICAL AND METALLURGICAL SECTION AT THE CANADIAN NATIONAL EXHIBITION, 1920.

National Electro Products Co.

With Mr. J. H. Carson in charge, this company exhibited the uses of oxygen and hydrogen for cutting. Their gases are produced by the electrolytic method. Demonstrations of the Purox Torch, which they are now introducing in Canada, were made. This torch is well-balanced, and possesses a safety device to avoid back-firing. The stock is on a universal joint, allowing greater convenience for overhead welding and general working. The company has plants in Toronto and Montreal, and is at present developing the hydrogen end of their business.

Brunner, Mond Canada, Ltd.

Mr. W. H. O'Reilly and Mr. J. M. Luck were in charge. The products manufactured by this company at Amherstburg were demonstrated, including soda ash, Crescent soda, and Crescent cleansing soda.

Canadian Salt Co.

Varieties of salt, and packages for dairy, packing-house and table use were displayed. Salt as the basis of chemical industries was illustrated by such products as caustic soda, zinc oxide and bleaching powder. Mr. McManus was in charge.

Hiram Walker Metal Products, Ltd.

Products, the manufacture of which are relatively new in Canada, were shown, including Hoskins' electric furnaces, pyrometers, Thermo couples, Chromel wire, Monel wire, Chromel triangles, Nickel Anodes in various shapes, Nichroloy products and Pyrometer tubes. Mr. R. W. Cunningham and Mr. G. Ryan, Ontario representative, were in charge.

International Nickel Co.

A great variety of products, illustrating the uses of Inco Nickel and Inco Monel Metal, were displayed. Nickel shot, as manufactured at Port Colborne, and a variety of nickel salts and compounds, as well as nickel anodes, decorated the booth. Various forms in which Monel Metal is used were illustrated by wire cloth, screens, rods, golf clubs, tapes, and Monel Metal trimmed valves. The general public was particularly interested in cutlery manufactured from Monel Metal. Mr. C. E. Macdonald and Mr. Schneider were in charge.

Abbott Laboratories.

This manufacturing house exhibited practically their complete line, specializing more particularly on their new Dakin Antiseptics. Various other pharmaceuticals were displayed, the whole effect showing the close connection between the manufacture of modern synthetic drugs and their application through the medical profession. Mr. W. Brannigan was in charge.

Canadian Industrial Alcohol Co.

The many uses of alcohol, as illustrated by an extensive chart of various raw materials, were displayed, and the manufacturing processes illustrated on a laboratory scale. The public was interested in viewing the large number of articles in everyday use which were dependent upon the use of alcohol at some stage in their manufacture. A complete line of partially denatured, completely denatured, and pure alcohol products were shown, as well as various heating devices illustrating the use of alcohol for this purpose. Mr. G. M. Appell was in charge.

Nichols Chemical Co.

Packages and containers illustrating the heavy chemical business were displayed. Practically all the common industrial chemicals were shown. Mr. H. D. Cameron was in charge.

Watson Jack & Co.

The general public, more particularly the ladies, were much interested in this exhibition of Canadian-made fabrics, all dyed by British and Swiss dyes. The fallacy that

the Germans alone were able to make good dyes previous to the war was exploded in the minds of not a few. Colors and chemicals were shown, and their application in the textile, leather and paper fields illustrated by finished products. Mr. W. R. Allen and Mr. J. A. Tait were in charge.

T. E. O'Reilly Co.

This exhibit consisted of sample products from the following companies: Commonwealth Chemical Co., Dow Chemical Co., pharmaceutical chemicals; Durham Chemical Co., hexamethylenetetramine; Emery Candle Co., stearic acid; Industrial Chemical Co., Filtchar, carbon black, whiting; Jacques Wolf & Co., textile chemicals; National Aniline & Chemical Co., food colors; Chas. Pfizer & Co., mercurials; Standard Ultramarine Co., Rollin Chemical Co., barium compounds; Rockhill & Vietor, natural essential oils; Stauffer Chemical Co., nitrate of soda; Tyson Bros., Inc., rubber substitutes; Van Dyk & Co., synthetic perfumes; Western Chemical Co., magnesia and ammonia compounds; Watts' Chemical Co., zinc oxide. Mr. Hopkins, Mr. Ridgeway and Mr. McCartney were in charge.

Ontario Oil & Turpentine Co.

This booth gave a beautiful display of natural blocks of pure magnesium sulphate and products as derived from British Columbia deposits. Samples of ground and recrystallized salt were shown. Mr. R. Pinchin was in charge.

Canadian Laboratory Supplies, Ltd.

A very complete line of laboratory equipment and scientific apparatus was displayed. A few of the types of apparatus of special interest to chemists were: British-made silico ware and bacteriological equipment and microscopes; Ainsworth automatic balance; Barnstead electric bubosc colorimeter; Orset & Fischer and Lunge apparatus;; viscometers, colorimeters, incubators, freezing and boiling-point thermometers, and various grades of filter paper were shown. Ball Mills of the Abbe type were exhibited, and considerable laboratory glassware which had been manufactured entirely in Canada.

The need for an Industrial Chemical Exhibition and the desirability of giving the public generally a more or less hazy correct idea, in place of the very hazy incorrect idea now so prevalent with regard to chemistry is illustrated by the following comments heard by those in charge of booths at the Chemical Section at the Canadian National Exhibition:—

A young lady, looking at chemical display, is heard to remark: "Look at the pretty colored beads."

A new description of J. T. Baker's chemicals has been discovered. They brought forth the comment: "Condensed eggs."

A few tables of pharmaceuticals brought forth the comment: "Are they germs or dyes?"

A small boy, describing a colorimeter, says: "If you look through that you can see all the people that pass in front of you."

"One enquirer, after carefully examining the exhibit of a laboratory supply house, asks the following question: "Do you handle bath tubs and faucets?"

At the same time it should not be forgotten that the public generally showed a very keen interest in the efforts of the chemical companies exhibiting.

ONTARIO'S METALLIFEROUS PRODUCTION, FIRST HALF YEAR—1920.

Returns received by the Ontario Department of Mines for the six months ending June 30th, 1920, are tabulated below, and for purposes of comparison the quantities and values are given for the corresponding period in 1919. Tons throughout are short tons of 2,000 lbs.

	— Quantity —		— Value —	
Product.	1920	1919	1920	1919
Gold, ozs.	277,656	231,729	$5,690,504	$4,666,759
Silver, ozs.	4,474,322	5,744,172	5,077,028	5,951,362
Platinum metals, ozs.	184.45	30.98	12,443	1,805
Cobalt (metallic) lbs.	113,239	59,337	266,045	92,157
Nickel (metallic) lbs.	4,854,979	5,147,745	1,696,687	1,825,347
Nickel Oxide, lbs.	3,491,544	5,503	814,070	1,567
Cobalt Oxide, lbs.	388,318	202,912	645,783	301,791
Other Cobalt Compounds, lbs.	1,417	26,289	1,029	16,164
Nickel Sulphate and Carbonate, lbs.	159,183	133,732	15,308	15,531
Lead, pig, lbs.	749,820	1,481,204	71,006	54,802
Copper Sulphate, lbs.	89,939	.....	4,497	.....
Copper, blister, lbs.	2,918,153	3,080,492	470,949	452,055
*Copper in matte, exported, tons	4,434	4,341	1,241,520	1,128,753
*Nickel in matte, exported, tons	9,527	7,072	5,338,120	3,535,915
†Iron Ore, exported, tons	2,189	5,804	18,512	44,309
‡Iron, pig, tons	28,771	24,095	739,079	670,512
Total			$22,101,580	$18,759,829

*Copper in matte was valued at 13 cents and nickel at 25 cents per pound in 1919. For 1920 the values have been placed at 14 and 28 cents per pound respectively. The total matte produced contained 15,030 tons of nickel and 7,705 tons of copper. See heading "Nickel-Copper" for explanation.

†Total shipments of iron ore were 13,962 short tons, worth $74,073.

‡Total output of pig iron was 321,826 tons valued at $8,255,916. Figures in the table represent proportional product from Ontario ore.

The aggregate output from metalliferous mines, smelters and refining works of the Province of Ontario for the six months ending June 30th shows a considerable increase in value over the 1919 figures. For the first time since 1903, when the Cobalt silver camp was discovered, the output of gold exceeds that of silver in valuation. The new electrolytic refinery of the British America Nickel Corporation is now in operation at Deschenes, near Ottawa.

Gold.

Ontario's position as a producer of gold is becoming increasingly important. For the first half of 1920 the output was nearly 22 per cent. greater than the 1919 production.

Silver.

The quantity of silver marketed during the period was considerably less than the output. An average price of $1.30 per fine ounce obtained for the first quarter of 1920, while for the half year the average New York price was $1.17 for silver in the open market as distinguished from the fixed price, retroactive to May 13th, of $1.00 per ounce (1000 fine) under the Pittman Act for metal produced, smelted and refined exclusively within the United States. For the month of June the average open market price in New York was 90.84 cents. This disadvantage to the Ontario producer, however, was more than offset by the exchange rate. Since June the export price of silver has risen gradually until it approaches the quotation for domestic silver.

During the period a total of 4,474,322 ounces, worth $5,077,028, were marketed. Of this total, 225,513 ounces came from the Miller Lake, O'Brien and Castle properties, at Gowganda, 23,414 ounces from nickel-copper refining operations, and 49,156 ounces from gold ores. Some producers of silver were paid for the cobalt content of ores, con-

centrates and residues marketed. In all, $138,317 was received for 296,116 pounds.

Refineries—During the half year, 1,445 tons of ore, 581 of concentrates, and 1,185 tons of residues were treated in the southern Ontario refineries located at Thorold, Deloro and Welland for a recovery of 1,477,490 ounces of silver in addition to arsenic, metallic nickel, metallic cobalt and compounds of these last mentioned metals. The companies operating were the Coniagas Reduction Co., Deloro Smelting and Refining Co., and Metals Chemical, Ltd., respectively. The last mentioned operated for the first three months of the year only, after which the plant was taken over by Ontario Smelters and Refiners, Limited. Alterations in plant and process were made, which prevented production during the second quarter of the year. This new company also owns the plant at Chippawa, formerly operated by the Standard Smelting and Refining Company. Copper sulphate was recovered from residues by one of the companies. It should be pointed out that the output of metallic nickel and nickel oxide from silver ores is small compared with that from nickel-copper refining. Only 203,713 lbs. of metallic nickel and 15,384 lbs. of oxide were marketed. In the table under the heading, "Other Cobalt Compounds," are included cobalt carbonate, hydroxide, carbonate and acetate.

Nickel-Copper.

During the half year, 627,681 tons of ore were raised and 520,705 tons smelted, the total output of nickel-copper matte being 28,365 tons, containing 15,030 tons of nickel and 7,705 tons of copper. The British America Nickel Corporation and the International Nickel Company of Canada worked the Murray and Creighton mines respectively, while the Mond Nickel Company raised ore from the Garson, Levack, Bruce, Worthington and Victoria No. 1.

Refineries—As regards shipments of matte, 7,944 tons went to Canadian refineries at Port Colborne, Ont., and Deschenes, Que., 16,323 tons to the United States, and 1,123 tons to Wales. During the period the new electrolytic refinery at Deschenes commenced operations and had 1,185 tons of matte in process on June 30th, although no refined metals were ready for market at that date. The new plant which permits recovery of metals of the platinum group in pure form is reported to be working very satisfactorily, as is also the smelter at Nickelton, one mile from the Murray mine, where the ore is smelted direct without preliminary roasting. In addition to metallic nickel, nickel oxide and blister copper, there was a by-product recovery at Port Colborne of the precious metals, gold, silver, platinum, palladium, rhodium, ruthenium, osmium and iridium. There was also a small recovery of copper in the United States from Ontario silver ores.

Iron Ore and Pig Iron.

Shipments of siderite ore from the Magpie mine by the Algoma Steel Corporation and of briquettes produced from magnetite ore by Moose Mountain, Ltd., Hutton township, totalled 13,962 short tons, valued at $74,073. The first mentioned used its entire output in the blast furnaces of the Corporation at Sault Ste. Marie, while the latter shipped its product to Quebec and the United States. The new Helen mine of the Algoma Steel Corporation has been diamond drilled and it is estimated that over 100 million tons of siderite are available for mining.

The pig iron output by the Algoma Steel Corporation at Sault Ste. Marie, Steel Company of Canada at Hamilton, and Canadian Furnace Company at Port Colborne was 321,826 short tons, valued at $8,255,916. Only 58,387 tons, or 8.94 per cent. of the total of 653,137 tons of ore charged to the 7 furnaces in blast was of domestic origin, the balance being imported from the United States. Furnaces of the Midland Iron and Steel Co., Parry Sound Iron Co., and Standard Iron Co., were not operated during the period. The output of steel from pig iron was 337,048 tons, valued at $1,661,570. These figures do not include any secondary steel produced in the electric furnace from scrap iron and turnings.

Lead.

The entire output of pig lead came from the mine and smelter near Galetta, on the Ottawa River, operated by the Kingdon Mining, Smelting and Manufacturing Company. The product was consigned to the Jas. Robertson Company, Limited, of Montreal, manufacturers of plumbing supplies. There is a small recovery of lead from the silver ores of Cobalt treated in the United States refineries, returns of which are received at the end of the calendar year.

NATIVE ARSENIC IN BRITISH COLUMBIA.

Native arsenic associated with calcite has been found on Alder Island, a small island of about three acres' extent in the Queen Charlotte group, B.C. Up to the present time sufficient work has not been done to determine either the nature or extent of the deposit. The metal, which occurs in medium-sized nodules with a mamillated surface and crystaline fracture has been found at a number of different points on the island imbedded in calcite. It is not yet known whether calcite is the filling of a large vein or whether, like the metal, it occurs in irregular patches. The discoverer, W. Gatt, is endeavoring to interest capital to develop the property. Native arsenic has been found in British Columbia, at Port Alberni, in the Alberni Mining Division; at Watson Bar Creek, in the Clinton Mining Division; at Eightmile Creek, in the Slocan Mining Division; and on the Koksilah River, in the Victoria Mining Division. It also has been reported from Alder Island previously, but in no instance has the discovery been followed by development.

As with few exceptions, arsenic is used in the form of oxide, there does not appear to be any particular advantage in obtaining it in the metallic state, more especially as nearly all the arsenious acid of commerce is obtained as a by-product in the recovery of other metals from ores in which arsenic forms a part. The principal uses of the oxide are in the manufacture of insecticides, weed-killers, and glass. To the last it is supposed to rectify the color given by other metallic oxides and to impart a brilliancy not to be obtained by any other substance.

In 1918 the United States was the principal producer of white arsenic, with an output of 10,275 metric tons; the United Kingdom came second, with 2,387 tons; and Canada third with 2,251 tons. Practically the whole of the United States' output was obtained from smelter fume. Last year the Hedley Gold Mining Co., owners of the Nickel Plate mine, in the Osoyoos Mining Division, B.C., obtained $21,000 from the American Smelting and Refining Company's Tacoma smelter for the arsenic content of the gold concentrate that the Hedley Company shipped. The great bulk of the Canadian output of arsenious acid is obtained from the silver-nickel-cobalt-arsenic ores of the Cobalt district, in Ontario.

JACQUES WOLF COMPANY EXPANDS.

The Jacques Wolf Chemical Company, Clifton, N.J., has awarded a contract to L. Swenson, 631 Main Street, Passaic, N.J., for the erection of a new two-story plant at Passaic, N.J. The new structure will cost in the neighborhood of $60,000.

With the Exhibitors at New York

General Impressions of the Sixth National Chemical Exposition with a Review of Meetings Held and Papers Given.

IN attendance, number of exhibitors, and, in many instances, the make-up of exhibits, the Sixth National Exposition of Chemical Industries made a new record for the week September 20th to 25th.

Four floors of the Grand Central Palace were completely occupied, and the chemical show gave evidence of rapidly outgrowing Central Palace accommodation. Confidence in the future was manifested by the securing of a much larger space for next year. This space was found in a very large armories in the Bronx.

The types of exhibits may he roughly divided into machinery and special equipment, dyestuff and color exhibits, general industrial and fine chemicals, pharmaceuticals and oils, lahoratory apparatus and measuring instruments.

Practically all those companies engaged in manufacturing these lines are now represented at the Exposition each year, and in the machinery and dyestuff exhihits some very remarkahle displays were made.

On entering the ground floor, the large scale exhibit of the Buffalo Foundry and Machine Company, which occupied practically one end of this floor, stands out as the largest display of special machinery. Here were found Vacuum Dryers, Evaporators, Chemical Equipment and Sugar Apparatus. One of the recent developments has to do with the manufacture of nitric acid by vacuum distillation. This apparatus was designed by Mr. A. Hough. The new nitric acid equipment produces a highly concentrated acid with some saving of labor and material. Another recent development with this firm has been the application of the Hough Nitrator for the manufacture of nitro-glycerine. By a special device the inflow of glycerine is shut off automatically, when agitation stops or slows down. Progress has been made in the design of machinery for continuous drying of liquid products. Machinery for the production of maltose and malt products is timely, owing to sugar costs and available hrewing equipment.

On the main floor were to be found most of those distinctly large exhibits. Only a very few may be mentioned as typical exhibits, but for those who have not been privileged to visit the Exposition it should be stated that every exhibit was worthy of the closest study of those particularly interested. For example, the Swenson Evaporator Company were showing both horizontal and vertical tube evaporators. The horizontal tube evaporator was shown in sections, to illustrate construction and method of securing tubes. The vertical evaporator was of the basket type. The advantages of visiting such machinery exhibits as were shown hy various companies manufacturing filtering apparatus, mixers, dryers and classifiers is the opportunity of examining their construction closely, and meeting in a few square yards such a number of expert engineers, who are able to discuss your specific problems in a most helpful manner.

A rather unique display was made by the J. P. Devine Co. A large space was reserved and a complete installation of a double-drum vacuum dryer, including dust-filter, surface condenser, and two-phase rotary valve dry vacuum pump, was shown. The feature of the exhibit was the decorations on the walls; the exact interior setting of their plant was reproduced. This remarkable background was made more attractive by a series of paintings done in oils, showing different products.

It remained, however, for the color manufacturers to set a new pace for themselves. With all the advantages of color at their command, they produced some very remarkable and beautiful effects. A typical exhibit of the type where dyed materials were given a live setting was the large hooth of the National Aniline & Chemical Co. Nearly everything in dressgoods was illustrated on models, and the display and variety of colors was amazing. It made a complete answer to those who fear that the American dye manufacturers will not he ahle to look after American color users. Other ideas were developed. The Dupont Co. stressed the synthetic production hy large models of chemical formulae, illustrated in the usual ball and framework manner. Geigy & Co., on the other hand, specialized in an exhibit that would appeal more readily to the actual dyer.

The usual complete displays of chemical manufacturers and laboratory supply houses all received close attention. Some very fine special equipment is now being turned out.

Hundreds of exhihits might he mentioned on their merits, hut the only way to realize their full interest and value is to arrange now to visit New York at the Exposition next year. There was a Canadian Section on the third floor. The exhibit from Canada of most general interest was that of the Canadian Pacific Railway. A large map of the Dominion was shown, and the whole wired with different colored light in such a way as to show railroads in red and white, and the location of various resources either awaiting developments or under development. Some 25 circuits made it possible to throw on the location of gold, coal, peat, etc.

This graphic method of illustration was most effective, and large crowds were constantly watching the operation of the electrical map. The Ontario Bureau of Mines had its usual good display of the mineral resources of the Province. The Canada Carbide Co., Ltd., and Canadian Electro Products, Ltd., showing acetic acid and other synthetic organic chemicals, represented the Shawinigan interests, while the Dominion Government was represented hy officers from the Water Powers Branch, and Forestry Branch, Dept. of Interior, and representatives from the Bureau of Mines and Statistics. A good number of Canadians were visitors at the Exposition this year, and it is to he hoped that this number may increase, as there are distinct advantages to he gained by all companies in having a live representative present.

Programme of Meetings.

All week meetings were held during the afternoon and evening. Prominent speakers developed the progress of chemical industries in the United States and Canada. On Monday the Exposition was opened by Dr. Charles H. Herty. No stouter champion exists in the United States for those things that are hest for chemical industries than Dr. Herty. The necessity for carefully watching the course of developments, particularly in the production of dyes, was stressed, and the need for continued alertness lest the nation forget to safeguard and develop those in-

dustries which Germany considers so vastly important.

Sir George E. Foster, of Ottawa, was expected to speak at this time, but was unable to be present. Canada was well represented, however, by Col. J. S. Dennis, of the C. P. R. His work in connection with the undeveloped resources of the country makes him very familiar with the field for development. He pointed out the richness of Canadian resources, showing also that the United States is best able to supply the elements necessary to Canadian development. The fact that 17 per cent. of the world's coal is in Canada has great future significance. The problems of Canadian development involving as they do capital and labor, were pointed out.

Problems Confronting American Exporters.

On Monday evening a paper by Erastus Hopkins was given, discussing the general problems of exporting from the United States. He pointed out that England, leading the world in export together with Germany before 1914, had the fundamental conception that they were selling goods, whereas the American exporter appears to believe that the world at large is buying goods. These are interrelated ideas, but the principles pertaining to the two are different when measured by the success of the two enterprises. The speaker claimed that in general American selling organizations do not study successful methods of other countries and apply them. The situation whereby the American youth leaves the United States to represent his company abroad with the promise of return in a few months, is not the way European countries have held business. If the English youth comes back he is asked why he has not made good. He is expected to become a colonist and grow up with the new country. The salesman must live in close touch with the true life of the foreign country to succeed, and peculiar features of the trade must be considered. In general, service, delivery, package, and finance are the serious problems. A foreign field must not be considered a dumping ground. Some very wholesome advice on proper methods of doing business in foreign fields was given.

Motion pictures followed showing the U. S. Ammonium Nitrate Plant No. 2 at Mussel Shoals, by courtesy of Dwight P. Robinson & Company, and modern packaging methods by the Pneumatic Scale Corporation.

Fuel Economy Symposium.

Several very valuable papers were presented. R. C. Beadle, Managing Editor of "Combustion," acting as chairman. During his opening remarks the acute problems of fuel were pointed out. The war created havoc with fuel supplies. A plea for conservation of resources, and a national campaign to get away from the "inexhaustible" supply idea that has brought about the present condition. The present is an opportunity for the combustion engineer. A high spirit of enthusiasm and leadership in a national service must be maintained.

Mr. W. O. Rankin presented a paper entitled "Burning Coal at 100% B. T. U. Efficiency. F. A. Uehling spoke on the Reduction of Chimney Losses. Alexander B. McKechnie discussed problems in fluid heat transmission. The early efforts at circulating high flash point oils were mentioned. With a hot oil the quantity of heat delivered is under control at all times, and product temperatures up to 550° F. are easily reached. The pressure is not great, and the system is good for cast integral jackets and glass enamelled steel tanks. The heat distribution is uniform, and the temperature may be controlled within close limits by various devices. Such a system is of vital importance in a delicate reaction. Charts show a difference in temperature from 3° F. to 7° F. in the circulating oil when thermostatically controlled. The fire hazard may be entirely removed. In such a system the points of design are: 1, Design of Heater or Absorber; 2, Type of Circulating Pump; 3, Type of System; 4, Quality of Circulating Oil; 5, Construction of Pipe Lines. The Absorber must be designed for maximum efficiency and accessibility, and the furnace to withstand high temperature. The circulating pump should be of the positive displacement rotary type, to insure known and non-pulsating flow. The closed system, where oxidation is avoided, is best. The circulating oils generally used have a coefficient of expansion of about .000486, which means 25% volumetric increase in 500° F. rise. An expansion tank is placed on the end of a dead line to take care of this. This expansion tank is open to atmosphere and does not permit a pressure to be built up.

The oil must have a high flashpoint and be pure. Viscosity and specific heat are important. The specific heat increases with the temperature on a straight line, the value at 550° F. being .62. Some applications of these installations were outlined.

Conrad Dressler described the fuel saving advantages of a Dressler Kiln. The idea of this kiln is uniform absorption and giving out of heat. The kiln is regulated to the products treated. These tunnel kilns are from 100 to 300 feet long, and are gas fired at a point two-thirds of the length from the mouth. The gas burns in two independent chambers, running on either side of the goods track for the whole length of heating up and firing zones. Fuel economy is due to: 1, Kiln Structure; 2, The recuperation of heat from the goods in cooling zone; 3, Drawing off products of combustion at low temperature; 4, Proportioning fuel to air and effective insulation.

A very excellent paper on Increasing conduction and reducing fuel consumption was presented by Wm. R. Van Nortwick. Other papers were: "Producer Gas and the Modern Mechanical Producer," by W. B. Chapman; "Refractory Cement: Life Insurance for a Furnace," by F. W. Relsman; "Preventing Conduction and Radiation Heat Waste," by S. L. Barnes.

Industrial Management Symposium.

Ellwood Hendrick acted as chairman of this Symposium on Wednesday. Papers were presented on "Ultra Analysis of Costs," by Harrington Emerson; "Research in Industrial Conservation," "Progress of American Coal Tar Industry," by Grinnell Jones. H. E. Howe, of the National Research Council, spoke broadly on Industrial Conservation. Several specific cases, drawn from different fields, were pointed out, but the general problem is to secure action and results from knowledge already possessed. Passive agreement must be changed to active application.

Materials Handling Symposium.

This meeting was in charge of R. V. Wright, editor "Material Handling Cyclopedia." Several papers were contributed by specialists in these problems. Under present labor and railway conditions every branch of industry is interested in the subject. The papers were: "Material Handling: The Paramount Problem," by J. H. Leonard; "Bringing the Food to the Table," by Burnsey W. Scott; "Cost Cutting with Conveyors," by W. T. Spiney; "Steel Collapsible Shipping Containers, as Related to Chemical

Industries," by Everett A. Morgan, and "Chain Power Transmission," by F. G. Anderson.

Chemical Engineering Symposium.

As usual, the Chemical Engineers presented a fine series of papers, David Wesson acting as chairman.

T. W. Pritchard introduced a new method of destructive distillation now in operation. The material is placed in a closed retort, either vertical or horizontal. The retort is sealed, and heat applied. An outlet pipe, either top or bottom, leads to a condenser. From the condenser the vapors, or such as do not condense, are carried to a blower, and from there forced through a super-heater, and returned to the retort, passing through the distilling mass, and by means of their positive carrying power and sweeping effect, they not only distribute the heat units through the mass, but act as a scavenger and carry out the vapors formed as rapidly as desired. The rate of flow of gases in retort directly controls the temperature. Besides temperature control, the time of distillation is reduced by at least one-third. The quantity of distillates is increased and quality improved. Results on Tennessee Cannel coal were given. A feature of the process is the fact that materials which expand in spongy masses may be easily treated. It has possibilities for rich shales.

Other papers were: "Nitration of Hydrocarbons," by A. Hough and W. Savage; "Recoverance: A Physical Property and Its Importance," R. G. Guthrie; "Operating Data on a Modern By-product Coke Oven Plant," by C. R. Bellamy; "Utilization of Peat," B. F. Haanel; "Corrosion of Iron and Steel as Affecting Industries," by W. D. Richardson; "Canada and the Chemist," by C. Price-Green. In this paper Mr. Price-Green reviewed the forest, water-power and mineral resources of the Dominion, pointing out the rather indefinite knowledge which exists in some quarters in the United States as far as Canadian resources are concerned.

Ceramic Symposium.

This was a meeting of the American Ceramic Society, in charge of R. H. Minton. Papers on "A Classification of Sheet Steel Enamels," by R. R. Davidson, and "Refractories," by H. F. Staley, were presented.

Following these symposiums, and on Saturday, a very large number of motion pictures were shown. This application of moving pictures to industrial processes offers a new way of teaching and bringing to the public a true appreciation of some little-known industries or localities.

The Sixth National Exposition of Chemical Industries has been brought to the point where it is very nearly impossible to do even scant justice in print to the efforts of all exhibitors. The exposition has become a dominant factor in the life of the chemical industries in the United States, and should become part of the education of anyone who may even in a casual way be interested in those industries. For those whose interest is of a business or professional nature nothing short of regular attendance can be of much value or give a true conception of the significance of the event.

A NEW YORK CONSOLIDATION.

The consolidation is announced of Westinghouse, Church, Kerr & Co., Inc., and Dwight P. Robinson & Co., Inc., under the name of Dwight P. Robinson & Company, Inc., Engineers and Contractors.

THE I. M. C. S. SCIENTIFIC EXPEDITION.

In the spring of 1919 three members of the Board of Directors of The International Metallurgical and Chemical Society decided to organize a private expedition for the study of the scientific aspects of the region beyond the 75° latitude. After much delay and overcoming many difficulties, the expedition had to be postponed indefinitely. This in no way lessened the enthusiasm which the original organizers of the expedition showed toward the project, but has greatly increased the determination to carry the project through to a successful conclusion. The idea of the expedition was unique. Others have co-operated in expeditions for exploring purposes, but very few, and no complete expeditions have ever been undertaken with the latest scientific equipment or carrying sufficient scientists to make a thorough scientific survey of the country. This then was the purpose of the expedition—"to investigate from a scientific aspect the North lands of Canada."

Permanent plans for the organization of the expedition are going forward, and the temporary executive committee has definitely decided that the first party shall leave Vancouver for the North in the early spring of next year. The expedition will be divided into three different parties: first, the explorers; second, the investigators; and third, the laboratory workers and recorders, who will be stationed at permanent camp where communication can be kept with the outside world. Leaving Vancouver by chartered boat, the party will explore Cape Bathurst, Banks Land, Parry Island, Ellesmere Island and Grant and Grinnell Island.

The expedition will be completely equipped with snow and ice-automobiles, hydro-aeroplanes, diamond drill and equipment, 5 kilowatt wireless sending set, and receiving instruments of extra sensitiveness, together with portable sets and wireless telephone, field chemical, assay, electrical, aerometric, astronomical and biological laboratories, motion picture machine, cameras, development and other supplies.

Each division of scientific endeavor will be represented by scientists who will record their observations. The expedition will carry the British flag, and will report its discoveries and observations to the Provincial Governments in which the investigations are carried out before being publicly announced. It is the intention of the committee to secure the services of a noted explorer to act as head of the expedition. Scientists will be appointed from among the Fellows of the International Metallurgical and Chemical Society, who will be specialists in the branches to which they are appointed. All members will serve without pay.

The idea of a scientific expedition has met with rank ridicule, but this has only served as a spur to further efforts in completing the organization. To carry equipment such as mentioned above for a thousand or more miles from civilization, to establish a permanent camp and keep up sufficient communication to furnish a party of twenty or more with sufficient supplies, is "an impossibility," a "crazy idea," etc., but the organizing committee believes it can be done, and says that it will be done. The opinion that it can be done is backed up by a famous explorer, who knows the Arctic from experience as probably no other man. To success or failure, the International Metallurgical and Chemical Society's expedition is to become a reality, the most complete and extensive expedition ever undertaken for scientific purposes.

Electrolytic Production of Hydrogen Peroxide*

Experimental Decomposition of Sulphuric Acid, Sodium or Potassium Acid Sulphate Solutions Showing Current Efficiencies Attainable in Production of Persulphuric Acid and Persulphates and Yield of Hydrogen Peroxide by Subsequent Distillation of Potassium Persulphate.

By F. W. SKIRROW† and E. R. STEIN†

THE following paper contains an account of some experiments which were carried out with the object of testing the current efficiencies attainable in some of the well-known methods for the production of persulphuric acid and persulphates, and the yield of hydrogen peroxide which can be obtained by the subsequent decomposition of these bodies as so produced.

Persulphuric acid was discovered by Berthelot, and its salts first prepared by Marshall (Trans. Chem. Soc., 1891-59, 771). The production of persulphates has received much attention, particularly by Elbs and Schonherr (Zeit. Elektrochem., 1896, 2, 245) and Muller and Friedberger (Zeit. Elektrochem., 1902, 8, 230). The Consortium fur Elektrochemische Industrie have patented methods for the production of persulphuric acid by electrolysis of sulphuric acid of sp. gr. 1.3-1.5 (German Patents 216538 and 217539 of 1905, British Patent 23548 of 1910). In the latter patent, hollow cooled anodes are recommended. It is claimed that the temperature of the electolyte may even become 17°-25° with advantage, provided the anode itself be cooled down to a sufficiently low temperature.

Hydrogen peroxide is technically prepared from persulphuric acid or the persulphates by distillation with sulphuric acid under reduced pressure. Thus Elbs (Zeit. fur Elektrochem, 1895, 1, 471) showed that when persulphuric acid was distilled with sulphuric acid under reduced pressure, hydrogen peroxide resulted, but that considerable losses of oxygen took place. The causes of this loss were traced by Price and Friend (J. Chem. Soc., 85, 1526) to the effect of traces of catalyst in the mixture of hydrogen peroxide and persulphuric acid, or Caro's acid.

In order to prevent the losses on distillation due to these catalytic impurities, Teichner (U. S. P. 916900, 1909) electrolyzes sulphuric acid to form persulphuric acid, using in the anode chamber a small auxiliary cathode, through which a small fraction of the current is allowed to pass, and which brings about the deposition of the disintegrated or dissolved platinum which would otherwise cause the hydrogen peroxide to decompose on distillation. Lowenstein (U. S. P. 1013791, 1912) describes a continuous process of distillation which rapidly separates the hyrogen peroxide from the impure solution and does not allow the incoming solution to be further contaminated by the catalyst in the spent liquor flowing out of the apparatus.

Pietzsch and Adolph (Br. Pat. 23158, 1910) eliminate the effect of impurities in a different way. Instead of using persulphuric acid as the medium, they prepare potassium persulphate electrolytically and eliminate the impurities by crystallization. The potassium persulphate is then decomposed by sulphuric acid, the $KHSO_4$ formed being filtered off from the resulting solution of hydrogen peroxide. In this way they claim to obtain a 30 per cent. solution with almost theoretical yield. The reactions which take place are the following:

$$(1)\quad K_2S_2O_8 + H_2SO_4 \longrightarrow K_2S_2O_7 + H_2SO_5$$
$$(2)\quad H_2SO_5 + H_2O \longrightarrow H_2SO_4 + H_2O_2$$
$$(3)\quad K_2S_2O_7 + H_2O \longrightarrow 2KHSO_4$$

Pietzsch and Adolph (B. P. 23660, 1910) further describe a method in which the re-crystallized potassium persulphate is directly distilled in vacuo with sulphuric acid, in which case the liberated hydrogen peroxide is distilled off as fast as formed, and so does not react with persulphuric acid or Caro's acid with loss of oxygen, according to the equations.

$$(1)\quad H_2S_2O_8 + H_2O_2 \longrightarrow 2H_2SO_4 + O_2$$
$$(2)\quad H_2SO_5 + H_2O_2 \longrightarrow H_2SO_4 + H_2O + O_2$$

Recently Levin (U. S. P. 1299485, 1919) has patented a method for the production of hydrogen peroxide through the medium of sodium persulphate obtained by electrolysis of sodium bisulphate. Sodium persulphate differs from potassium persulphate in being very much more soluble in water. In this case re-crystallization is not feasible, owing to high solubility of the sodium persulphate. The suspended impurities are gotten rid of by filtering through porous earthenware slabs, the electrolyte being periodically treated with H_2S to remove dissolved platinum or lead. It is pointed out that on distillation of sodium or potassium persulphate with sulphuric acid, the hydrolysis forming hydrogen peroxide is much slower than in the case of persulphuric acid, thus allowing the hydrogen peroxide to distill off as fast as formed and largely eliminating the decomposition due to the interaction of both persulphuric acid and Caro's acid.

Preliminary Experiments.

Attempts were first made to electrolyze sulphuric acid without the use of a diaphragm. These, however, resulted in low efficiencies, and were abandoned in favor of the use of a porous clay anode cell. Attempts were also made to get away from the necessity of using a platinum anode, the cathode in all cases consisting of a lead plate. The following substitutes were tried for the platinum anode: Gold, lead peroxide (Plante accumulator plate), lead peroxide deposited on platinum, fused Fe_3O_4, manganese dioxide deposited on platinum, platinum plated on copper which had first received a deposit of gold. Gold was found to be entirely too easily attacked. The lead peroxide invariably dissolved in the persulphate formed and precipitated as lead sulphate. The Fe_3O_4 went readily into solution, whilst the platinum plated on gold and copper revealed the presence of minute pores, allowing attack on the gold and copper base and speedily bringing about disintegration of the deposit. The manganese dioxide was without effect on the efficiencies, and suggested the possibility of a compact electrode of this material. (See also

*Paper presented at 38th general Meeting of American Electrochemical Society, Cleveland, Oct. 2, 1920.

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Laurie, Chem. Trade J., 1919, 64, 453; C. A., 1919, 13, 1904.) As no such material was available at the time, recourse was therefore had in the following experiments to the use of a polished platinum anode.

Preparation of Persulphuric Acid.

The experiments on persulphuric acid were carried out in a small cell which consisted of a porous anode compartment of about 500 c.c. capacity immersed in the electrolyte contained in a beaker, the beaker being cooled externally and the anode compartment cooled internally by means of a glass coil. The anode consisted of a platinum plate of 20 sq. cm. area, except in the case in which the anode itself was cooled, when a platinum crucible was used carrying a stopper with inlet and outlet tubes for the cooling liquid.

The following tables give typical results obtained:

TABLE I.

The cell was cooled externally with ice and salt, and the anode cooling coil with circulating cold brine. The plate electrode was used. Current density 51 amp. per sq. dm. Average temp. 11° C. Anode volume 275 c.c.

Time, hr. min.	Volt age.	Amperes.	Total weight $H_2S_2O_8$ Gr.	Weight $H_2S_2O_8$ 100 c.c. sol. gr.	Percent $H_2S_2O_8$ by wt.	Amp. Eff. Percent.
0:	8.20	10.40	....	....	....	....
0:15	8.25	10.20	6.14	2.23	1.55	66.40
0:30	8.29	10.16	12.37	4.53	3.16	66.40
0:45	8.35	10.08	18.55	6.80	4.75	66.90
1:00	8.34	10.13	23.50	8.65	6.05	63.60
1:15	8.36	10.11	27.90	10.30	7.20	60.75
1:30	8.40	10.17	30.54	11.30	7.90	54.80
1:45	8.46	10.17	34.08	12.66	8.81	52.30
2:00	8.47	10.20	35.77	13.31	9.31	48.10
2:15	8.48	10.18	37.45	14.01	9.80	44.70
2.30	8.47	10.16	37.92	14.22	9.95	40.70
2:45	8.46	10.20	38.85	14.65	10.25	37.90
3:00	8.45	10.20	38.70	14.64	10.24	34.90

TABLE II.

The cell was cooled in ice water, and the hollow cooled electrode used, through which ice water was circulated. The electrolyte was the same as in Table I. Current density 66 amp. per sq. dm. Average temp. 17° C. Anode volume 400 c.c.

Time, hr. min.	Av. Amp.	Av. Volts.	$H_2S_2O_8$ by analysis Gr.	$H_2S_2O_8$ per 100 c.c. sol. gr.	Percent $H_2S_2O_8$ by wt.	Theor. $H_2S_2O_8$	Amp. Eff.
0.	6.0	7.2	....	....	....	....	....
0:15	6.1	7.4	2.13	0.53	0.36	5.56	38.4
0:30	6.1	7.3	7.34	1.83	1.29	11.19	61.6
0:45	6.05	7.2	10.88	2.71	1.91	16.68	64.9
1:00	6.0	7.2	13.67	3.44	2.42	22.05	62.1
1:15	6.0	7.1	17.15	4.24	2.99	27.34	62.8
1:30	6.0	7.1	20.08	5.08	3.58	32.80	61.4
1:45	6.0	7.1	22.32	5.65	3.99	37.28	59.8
2:00	6.0	7.1	24.35	6.20	4.25	43.75	55.7
2:15	6.0	7.1	26.40	6.74	4.75	49.21	53.6
2:30	6.0	7.1	27.65	7.08	5.00	54.67	50.8
3:00	6.0	7.05	29.55	7.58	5.35	65.81	45.0
3:15	6.0	7.05	30.80	7.95	5.60	71.09	42.3
3:30	6.0	7.0	31.50	8.15	5.75	76.55	41.2

TABLE III.

The cell and hollow cooled electrode were cooled in tap water which was at 22° C. Average temp. 28° C. Current density 62 amp. per sq. dm. Anode volume 400 c.c.

Time, hr. min.	Av. Amp.	Av. Volts.	$H_2S_2O_8$ analysis Gr. by	$H_2S_2O_8$ 100 c.c. sol. gr. per	$H_2S_2O_8$ by wt. Percent	Theor. $H_2S_2O_8$	Amp. Eff.
0:15	6.2	6.2	3.29	0.63	0.59	5.65	58.2
1:00	6.1	6.1	12.05	3.06	2.20	22.20	54.4
1:15	6.1	6.06	14.69	3.74	2.64	27.75	53.0
1:30	6.1	6.06	16.55	4.23	2.98	33.35	49.7
1:45	6.1	6.05	18.03	4.62	3.26	38.90	46.4
2:00	6.06	6.04	20.25	5.20	3.66	44.20	45.4
2:15	6.06	6.04	21.15	5.45	3.84	49.70	42.6
2:30	6.06	6.04	22.98	5.93	4.18	55.20	41.7
2:45	6.05	6.06	24.42	6.30	4.44	60.07	40.4
3:00	6.08	6.07	25.67	6.65	4.60	66.50	38.6
3:15	6.07	6.09	26.35	6.85	4.83	72.00	36.6
3:30	6.07	6.10	26.94	7.00	4.92	77.50	34.77

Comparison of these tables shows that with hollow cooled electrodes almost as good results may be obtained with an electrolyte temperature rising to 30° C. as with a temperature of 12° C. when the electrode is not cooled.

The volume of anolyte was smaller in Table I. than in Tables II. and III.; hence the higher concentration reached in that experiment.

Distillation of Persulphuric Acid.

The persulphuric acid obtained in accordance with the methods outlined was filtered through paper and distilled in vacuo in an all-glass apparatus. It was found, however, that practically no hydrogen peroxide was obtained, and as at the time, due to war exigencies, no adequate filtering media were available, the distillation of persulphuric acid was abandoned, and attention turned to the potassium salts.

Preparation of Potassium Persulphate.

In the first experiments on the preparation of potassium persulphate the cell used was similar to that used in the experiments of persulphuric acid, with the exception that a saturated solution of $KHSO_4$ was used as electrolyte. It was found that the impoverishment of the solution due to precipitation of $K_2S_2O_8$ led to very low current efficiencies. In order to overcome this, a continuous type cell was constructed. The electrolyte was contained in a well-cooled reservoir, from which it flowed through the anode compartment of the cell, and, together with the precipitated potassium persulphate, flowed away from the bottom of the anode compartment to a filter which removed the potassium persulphate, the filtered electrolyte being resaturated with potassium bisulphate and returned to the reservoir. The anode compartment was cooled by means of a coil, and the whole cell jacketed with an ice-salt cooling mixture. The hollow cooled anode was also tried, but did not give results as good as those obtained by the use of a platinum plate as anode. The cell was allowed to run until the whole of the solution employed became saturated with potassium persulphate.

The following results obtained in a six-hour continuous run are typical:

TABLE IV.

Average temperature, anode compartment, 13° C. Average rate of circulation, 3.8 liters per hour. Volume of liquor in circulation, 3 liters, saturated at the temperature of the reservoir. Volume of anode compartment, 300 c.c.

Time.	Av. Amp.	Av. Volts.	Dry Wt. of ppt. g.	Per cent $K_2S_2O_8$ in Sample.	Actual $K_2S_2O_8$ from Per-cent.	Per cent Eff. per each hour.	Amp. Eff. for Run.
1 hour ..	10.0	8.1	33.4	76.6	25.6	50.8	50.8
2 hours..	9.9	9.6	36.2	63.6	23.0	46.2	49.0
3 " ..	10.1	10.1	34.0	85.0	28.6	56.2	51.5
4 " ..	9.9	10.9	31.6	77.0	24.4	49.0	50.9
5 " ..	9.9	11.2	26.0	77.5	20.2	40.5	48.7
6 " ..	10.1	14.6	26.9	82.6	22.2	44.5	48.0

In one run 1 g. of KCN was added per liter of electrolyte, as this substance is one of those which have been recommended as a useful depolarizer. It was found, however, in this case to be without any marked beneficial effect on the yield.

The potassium persulphate obtained varied a good deal in crystal size; the finer precipitates obtained were filtered only with difficulty, and tenaciously retained mother liquor. This explains the considerable differences in the percentage composition of the dried precipitate, the balance of the samples consisting of $KHSO_4$. On one recrystallization of the crude material a product analyzing 99.9 per cent. $K_2S_2O_8$ was obtained.

Distillation of Potassium Persulphate.

The potassium persulphate was mixed with sulphuric acid and water, and distilled from a glass distilling flask.

which was arranged so that vapors could not come in contact with rubber. The distillate was collected in a well-cooled receiver, which in turn was in communication with a good pump and monometer.

The first experiment on this distillation was carried out on a sample of Kahlbaum C. P. material analyziing 99.35 per cent. $K_2S_2O_8$. When the procedure had been modified to obtain the best results with this material, distlllations were made on the once-recrystallized potassium persulphate made by the procedure before outlined, and also on the crude uncrystallized material. In the case of the Kahlbaum material and of the recrystalized material, 100 g. of persulphate was mixed with 67 c.c. of 1.6 sp. gr. H_2SO_4 and 50 c.c. of water, these proportions being those quoted by Pietzsch and Adolph (*loc. cit.*). As the distillation proceeded, water was continuously added so as to keep the total volume constant in the distilling flask. In the case of the uncrystallized material, an amount was taken which contained 100 g. of $K_2S_2O_8$, and a proportionately larger amount of water was added at the start. The distillate was collected in two separate receivers, the first half giving a fairly concentrated hydrogen peroxide solution, the second half being a weaker solution. The runs were continued till the residue showed no potassium persulphate. The following table contains the results obtained:

TABLE V.

Material.	Vol. distillate, 1. c.c.	Percent H_2O_2 distillate by wt.	Vol. distillate 2. c.c.	Percent H_2O_2 distillate 2.	Total volume distillate. c.c.	Total wt. H_2O_2	Yield, Percent.
Kahlbaum ..	41	13.17	88	3.59	127	10.3	81.7
Recryst	95	9.31	72	1.04	167	9.9	78.4
71.6% crude .	140	3.42	15	0.18	155	4.8	38.3
80.8% crude .	136	....	..	...	136	6.2	48.9

In some cases the material in the distilling flask showed considerable tendency to foam.

Preparation of Sodium Persulphate.

This was effected in a cell having a porous porcelain anode compartment of 600 c.c. capacity, provided with cooling coils through which brine was circulated. The electrolyte consisted of a solution of $NaHSO_4$ saturated at the temperature of the cell. It was found that improved efficiencies were obtained by agitation of the liquor around the anode by means of an air current. The current efficiencies obtainable were better than with the potassium salt previously referred to, and although in the formation of persulphuric acid the current efficiencies were somewhat higher in the early stages of a run, the efficiencies in the case of the sodium salt appeared to be much better maintained than in the case of persulphuric acid.

The following table gives a typical run:

TABLE VI.

Current density 65 amp. per sq. dm. Average temp., 11° C. Anode volume 600 c.c.

Time.	Av. Amp.	Av. Volts.	$Na_2S_2O_8$ per 100 c.c.	$Na_2S_2O_8$ total. g.	Theoretical wt.	Yield, percent.
1 hour ...	13.0	10.3	5.53	33.15	57.7	57.5
2 hours ..	13.8	9.6	11.07	66.40	119.0	55.7
3 " ..	13.6	9.7	16.65	99.60	179.4	55.5
4 " ..	13.2	10.6	19.55	117.00	237.8	49.2
5 " ..	12.6	10.9	23.40	140.00	293.8	47.8
6 " ..	12.5	11.0	27.4	164.3	349.3	47.0

It will be noticed that the concentration of sodium persulphate rose as high as 27 per cent. in about six hours. In one case, however, it was impossible to get a concentration above about 9 per cent. $Na_2S_2O_8$, the persulphate crystallizing out as formed. In this case 230 g. salt crystallized out containing over 53.4 per cent. $Na_2S_2O_8$. It is possible that some double salt was here precipitated.

Distillation of Sodium Persulphate.

The apparatus used for this distillation was the same as that described under the distillation of potassium persulphate.

The material used was the concentrated solution of sodium persulphate obtained from the electrolytic apparatus, and contained in all cases above 25 g. $Na_2S_2O_8$ per 100 c.c. The solution from the electrolyser was filtered through a fine grade alundum filtering cone to remove catalytic impurities. The ratio of acidity to persulphate was varied over a wide range, and the amount of water present was also varied. In no case, however, could a yield of hydrogen peroxide be obtained above 9 per cent. of that theoretically possible from the sodium persulphate taken. The following table shows the materials distilled and the yields obtained:

TABLE VII.

Volume $Na_2S_2O_8$ taken. c.c.	Weight $Na_2S_2O_8$ g.	H_2SO_4 added g.	Water added c.c.	Total acid in g. H_2SO_4	Yield H_2O_2 Percent
250	69.5	0	0	38	4.3
220	60.5	0	0	33.5	4.3
250	68.4	90	0	128	4.5
155	39.2	377	0	400	7.9
154	48.8	340	50	400	9.0

Some attempts were made to improve the above yields by first heating the filtered solution of sodium persulphate under pressure in a bomb. The results showed that on heating in a bomb, amounts of hydrogen peroxide up to 23 per cent. of the theoretical were generated, but on subsequent distillation of these solutions the yield of hydrogen peroxide fell to below 7 per cent., and are thus in the same class as the direct distillations already quoted.

It is clear that filtration as a means of removing catalytic impurities would need to be effected through an extremely carefully graded filtering medium in order to attain purification comparable to a single recrystallization of the potassium salt.

Summary.

1. Of the materials experimented with as anode material, platinum was the only one offering possibilities of success, with the possible exception of manganese dioxide.

2. The current efficiencies in the production of persulphuric acid, potassium persulphate and sodium persulphate show no great advantage for any one of them over the others.

3. Sodium persulphate solutions can apparently be produced to a much higher concentration than can persulphuric acid, without sacrifice of current efficiency. The potassium salt is, of course, obtained in solid form.

4. Distillation of once recrystallized potassium persulphate with sulphuric acid and water gives reasonably high yields of hydrogen peroxide.

5. Distillation of persulphuric acid or sodium persulphate solutions would need to be preceded by extremely rigorous purification to remove catalytic impurities.

Shawinigan Laboratories, Limited,
Shawinigan Falls, Quebec, Canada,
August 3, 1920.

PURCHASES VARNISH PLANT.

The Ault & Wiborg Company, of Cincinnati and Toronto, has purchased the plant and other interests of the Queen City Varnish Company, Dana Street and Montgomery Road, Evanston, just outside of Cincinnati. This plant is said to be one of the largest and most modern in the country.

Experiments on the Corrosion of Iron and Steel

Results of Experiments Extending Over Ten Years on the Corrosion of Iron and Steel—Factors Influencing Corrosion—Corrosion of Polished Iron Surfaces.[1]

By WILLIAM D. RICHARDSON

THE views on rust set forth in this paper were first publicly expressed in an address before the Chicago Section, American Chemical Society, January 18, 1910, and subsequently before various societies. The experiments described cover the period from 1908 to 1919, inclusive.

The chemist who has followed the experimental work done on the corrosion of iron and steel during the past ten or fifteen years must have noticed the apparently contradictory nature of many of the experimental results and conclusions drawn from them and must have felt that the theory of corrosion lacked some essential factor or factors to make it even an approximately complete generalization. No chemist to-day can safely predict on the basis of theory what metal or metals will corrode most or least under a given set of conditions, and even with the results of the very large number of experiments, which have been made by different investigators, before him, it would be difficult for him to recommend with certain assurance the best metal for a given service. Much has been claimed for old-fashioned wrought iron, for iron or mild steel containing a small amount of copper, for very pure iron produced by the open-hearth process, for special finishes and for special protective coatings, and still in any given set of circumstances wherein iron and steel are exposed to the weather or to conditions which favor corrosion, there is always a doubt as to which of several metals will have the longest life and how the corrosion or pitting will proceed. The common statement of the theory of corrosion based on Nernst's theory of electro-motive force[2] while convincing in the abstract, fails when subjected to test, to explain the experimental results obtained. However, the electrolytic theory undoubtedly includes all the fundamental facts, and if it fails to explain the course of corrosion in any given instance, this is probably because some essential facts have been overlooked or have not been sufficiently emphasized and correlated.

It is a matter of common knowledge that after the process of corrosion has once gotten well under way, it usually follows a more rapid course than in the beginning. It is also well known that corrosion starts with greater difficulty on a polished surface than on a smooth but somewhat rough surface. Various investigators, however, have shown the profound influence of surface conditions, including mill scale and oxygen, on the commencement and progress of corrosion in iron and steel. The present paper points to the conclusion that surface conditions in many cases so far outweigh the influence of the composition of the metal that they are decisive in determining the course of corrosion and that they are in most instances of greater importance than the composition.

Some years ago it was thought that it might be possible to develop an accelerated corrosion test in sulphuric acid which would give indications of the comparative resistance to corrosion of various samples of iron and steel, at least in the same classes. However, it was soon noticed that there were great differences in the results obtained by the accelerated corrosion test in sulphuric acid when compared with service tests on the same metal. For example, of two kinds of steel, one might dissolve in sulphuric acid of a given strength in approximately one-half the time required for the solution of the other, yet when exposed to moist air, corrosion would be found to proceed with approximately equal rapidity. Many other cases of lack of parallelism between the course of corrosion under the accelerated test and under the service tests might be given. These can only be explained by differences in surface conditions, including those affecting the E.M.F. of the local electrolytic circuits and those influencing polarization and depolarization, when the composition of metal is the same in comparative tests.

The salt spray method of J. A. Capp[4] is useful for disclosing pinholes and uneven or thin protective coatings, and this is the purpose for which it was designed. As an accelerated corrosion test it would yield results comparable only to service conditions involving the same corroding influences.

The obvious difference between iron dissolving in acids and corroding in the presence of water and oxygen, is the cleanness of the surface in the former case, and the presence of rust in the latter case. The rust is adherent if alternate wetting and drying occur, and loose and flocculent, usually, if the iron is continuously wet or submerged.

Another difference, so obvious, between the two cases, is the polarizing effect of hydrogen in the first instance.

A clean iron surface is usually maintained when corrosion takes place under conditions of continuous submergence, and this is especially true when the medium is quiescent. This surface condition approaches most closely to that of iron dissolving in acids, although the presence of rust, even though in a flocculent condition, must be taken into account. The depolarizing effect of the moderate amount of oxygen present is also an active influence when the surface of the watery medium is exposed to air.

This remarkable difference in the behavior of different samples of iron to acids and in service tests requires explanation, since the solution of iron in acids and the ordinary corrosion of iron are such intimately related phenomena.

The ferroxyl indicator of Walker and Cushman is a most useful instrument for investigating corrosion phenomena, and can be usefully applied in the present investigations.

Walker has shown that a marked difference of potential exists between mill scale and bright iron.

Preliminary Experiments—Series 1. ....

If a piece of piano wire (99.85 per cent. iron) or pure open-hearth iron (99.95 per cent. iron) be carefully cleaned and rubbed with fine emery, bent U shape and one arm burned in a flame to coat this arm with magnetic oxide

[1] An abstract of the paper read and discussed at the Twelfth Semi-Annual Meeting of the American Institute of Chemical Engineers, Montreal, Canada, June 28-29, 1920.

[2] Whitney, J.A.C.S., 25, 1394.

[3] Proc. A.S.T.M., 7, 1907.

[4] Proc. A.S.T.M., 14; Part I, 475 (1914) 18; Part I, 237 (1918).

(the other arm remaining bright) and if the whole be submerged in ferroxyl jelly, the bright arm becomes quickly surrounded by a blue zone, showing an anodic region, and the oxidized arm by a red zone, showing a cathodic region. The cathodic character of mill scale can be shown also by its behavior toward diluted copper sulphate solution. After coating a piano wire with mill scale (in the flame) cross scratches are made, say 1-16 to 1-32 inch apart, exposing the bright iron beneath. When such a wire is inserted in dilute copper sulphate solution the copper begins to deposit on the magnetic oxide instead of on the exposed iron.

If a strip of nearly pure iron be allowed to rust by contact with moist filter paper or cloth, preferably in a closed chamber, and dried, and if one-half be cleaned to expose bright iron; and if the strip be then bent to U shape and submerged in ferroxyl jelly, the clean part becomes anodic, the rusty arm cathodic. Small regions of the rusted arm may become anodic owing to the fact that the rust has not adhered closely enough to cover entirely the bright iron, but by far the greater part if not all will in all experiments be cathodic.

The last experiment may be performed in another way. A piece of nearly pure iron is pickled to remove mill scale, washed and dried. Drops of water are then sprinkled over the surface and allowed to dry in the air at a low temperature, whereupon spots of rust are produced conforming closely to the original configuration of the water drops. After the ferroxyl jelly is poured over the surface the blue and red areas correspond precisely with the areas of bright iron and rust respectively. The rust spot areas always become cathodes, usually entirely, always in part. The bright spots become anodes for the greater part, although it is true that occasionally a red area develops over apparently bright iron. But it is possible that in these exceptional cases the apparently bright iron is covered by a thin invisible oxidized layer. In experiments of this sort the outer edge of the jelly where it is in contact with the metal always turns bright red. This point will be briefly discussed.

It is interesting to note the effect of pouring the ferroxyl jelly on cleaned bright "pure" open-hearth iron. A red border forms at the outer edge of the jelly almost immediately, showing that the metal here is cathodic. Next to this a blue band develops and the interior is at first faint pink, but in the end the interior usually becomes blue provided the ferroxyl jelly covers only a moderate area. The red border, which is always intense, begins to form at the extreme outer edge of the jelly where it is in contact with the metal. Here the oxygen of the air would have the greatest depolarizing action and it is reasonable to suppose that we have here in effect the action of an oxygen cathode. In connection with the rust and mill scale experiments, this one is interesting in showing how surface conditions may easily outweigh in electrolytic effect the varying compositions or iron and steel. The rusting experiments with ferroxyl jelly may be repeated with any kind of ordinary sheet iron (including mild steel) with the same results. No kind of iron or steel has been found which did not react in the same way.

Earlier Tests. Series 2 Experiments.

Some years ago when enterprising American manufacturers put on the market a very pure iron made by the open-hearth process the product was hailed with joy by users of iron, who were led to believe on the basis of the electrolytic theory of corrosion that this new and pure form of iron would resist corrosion better than the common varieties. The iron in question contained (by difference) from 99.94 per cent. to 99.95 per cent. pure iron, as a rule. All the investigators who did pioneer work on the electrolytic theory of corrosion, particularly in the United States, were unanimous in believing that a pure iron of this type ought to show great corrosion-resisting qualities. These points are now matters of history, and in brief it may be stated that the new iron did not come up to expectations as regards corrosion-resisting qualities over ordinary open-hearth sheet iron or mild steel. Therefore an investigation of its qualities was begun beginning with acid tests. The iron dissolved very slowly in 5 per cent. sulphuric acid and in fact so resisted the action of the acid that it was thought it should possess great corrosion-resisting qualities in service. Many samples were tested in acid against wrought iron, ordinary open-hearth iron, Bessemer iron and cast iron and in all cases similar results were obtained. The new iron dissolved much more slowly than the others. In spite of these acid tests there was a reasonable doubt as to the corrosion-resisting qualities of the iron under atmospheric conditions in service. Practical tests, under identical circumstances, of the new iron in comparison with common open-hearth sheets were not proving the new metal to have better corrosion-resisting qualities than the old. Consequently other tests were demanded. A series of tests known as Series 2 Experiments was begun as follows:

Twelve pieces of common sheet iron or mild steel and twelve pieces of the pure open-hearth iron were suspended alongside of each other in distilled water at rest and in 10 per cent. sodium chloride brine at test, in distilled water with air agitation and in 10 per cent. sodium chloride brine with air agitation. The pieces were of definite area and were all weighed when put into the various liquids. They were taken out at intervals, the adhering rust removed by suitable means, weighed, and the loss in weight calculated to grams per square centimeter. It was thought that conditions represented several service conditions as well as could be expected, having advantages over several other methods which suggested themselves; for practical reasons also, the surface of the pieces was not changed by the removal of mill scale before immersion, inasmuch as it was thought best to test the iron as received from the mill. The layer of mill scale on the surface of the metal afforded some protection for a time, but the corrosion gradually removed it, so that ultimately all the pieces were bright under the rust. This removal of the magnetic oxide layer occurred sooner in some pieces than in others, but working on averages there was no essential difference, at various stages, in the pieces of new iron as contrasted with the common iron.

In brief, the results of these experiments showed that the new iron had no advantage whatsoever over ordinary open-hearth sheet iron as regards rust-resisting qualities.

The conclusions drawn from these experiments and from other practical tests was that iron of the purity attained, namely, 99.95 per cent., had no advantage in rust-resisting qualities over ordinary iron or mild steel, whatever gain there might be in physical properties.

Series 3 Experiments.

This series of experiments was started in order to ascertain how much acceleration of corrosion could be brought about by pure oxygen over that induced by air alone. The plates used in the experiments were ordinary open-hearth

black iron (mild steel) No. 16, 6 x 6 inches square. The conditions to which the plates were subjected were as follows:

1. Water with air agitation, two hours each day.
2. Water with air agitation for two hours each day, plates dried in the air on alternate days, three times per week.
3. Water with oxygen agitation, two hours each day.
4. Water with oxygen agitation, two hours each day, dried in the air on alternate days, three days per week.

The reason for limiting the agitation to two hours per day was the large amount of oxygen required if oxygen was used continuously. In conditions 3 and 4 an oxygen atmosphere was maintained (except when the plates were being dried) by confining the entire apparatus under a large bell jar.

The experiments were continued for 1,000 days, but the conditions were such that the results are only comparable among themselves and cannot be compared with the results obtained in Series 4 Experiments. The results are interesting as indicating the importance of oxygen as an accelerator of corrosion. The plates which were hung submerged in water throughout the experiments, the water being kept saturated, or nearly saturated, with oxygen, lost 118 grams on the average in 1,000 days, whereas the comparative experiment in which air was used produced a loss of 85 grams. Where the plates were exposed to air agitation and dried in air there was a loss of 93.7 grams before the surfaces were cleaned and from the comparative plates where oxygen was used for agitation and which were dried in the air also, a loss of only 84.9 was recorded. After cleaning off the rust and scale by means of the sand blast, the former plates showed a loss of 167 grams and the latter of 139. The submerged plates remained clean throughout the experiment after the mill scale was removed and exhibited to the last a fairly smooth, finely crystalline surface which was covered during the progress of the experiment more or less with soft and flocculent ferric hydroxide. The results indicate clearly that pure oxygen is a more powerful corroding agent than atmospheric air, although corrosion in the presence of air is assisted by a small quantity of CO_2 which has been shown to work in a cyclic manner.[5] The plates which were dried in the air and hence subjected to the enormously accelerating effect of adherent rust were badly corroded and pitted. The oxygen plates were more severely pitted than the air plates. Nevertheless, the loss from the plates exposed to oxygen was less than those exposed to air. This can be accounted for by the fact that the rust adhered more closely to the oxygen plates than to the air plates, and while the deposit was not sufficiently uniform or extensive to protect the plates completely, nevertheless it served to reduce the loss even in the presence of oxygen which ordinarily, and without the protective action of the adherent rust, would have acted as a stronger corroding agent than the air. In this case the corroding agent and not the composition of the metal modified the behavior of the products of corrosion.

Factors Influencing Corrosion.

The factors influencing corrosion considered in this paper are four in number:

1. Composition of the metal.
2. Physical treatment to which the metal has been subjected.
3. The influence of atmospheric oxygen and other atmospheric constituents.
4. The influence of the products of corrosion or rust.

(1) Composition.

According to the electrolytic theory, based on the solution pressure hypothesis of Nernst, corrosion of iron has been held by many chemists to be determined by the composition of the metal and perhaps the majority of papers written on the subject take this point of view. All of the kinds of iron and steel considered in this paper corrode easily with the single exception of Durion, which does not corrode at all. This metal is stated to contain approximately 15 per cent. of silicon and hence is an alloy of so different a composition from the other metals considered as to require entirely separate treatment. It is possible that there are no or few ferrite areas or surfaces exposed in this alloy and hence little opportunity for iron, owing to its solution pressure, to go into solution under any conditions even in the presence of strong and weak acids. An investigation is needed of an entire series of iron-silicon alloys containing increasing percentages of silicon up to the quantity necessary to prevent corrosion, and such a study should include crystallographic examination and corrosion tests. An investigation is also much needed of other iron alloys, including iron-nickel alloys and tool steels, from the standpoint of corrosion. There must be some point, more or less critical, at which corrosion or corrodibility rapidly diminishes or ceases and the study of the composition corresponding to this point or curve region should throw much light on the general problem of corrosion. For present purposes only the ordinary types of iron and steel are under consideration and any statements made, if not otherwise qualified, refer to such varieties. The Series 2 Experiments point to the conclusion that composition is not the determining factor in corrosion and that impure metal does not necessarily corrode faster than pure. In these experiments the external conditions obviously govern the rusting, and bring both impure and pure iron close together in final loss. Series 3 Experiments show the dominating influence of oxygen and air over composition in governing corrosion in the same kinds of metal. Further discussion of the influence of composition on corrosion will appear later.

(2) Physical Treatment.

Under physical treatment are to be considered the various heat treatments, working the metal under heat, rolling and annealing, puddling, etc. Some of these treatments change the composition of the metal, others only its physical structure, or, more important, its surface, and corrosion, it may not be amiss to emphasize, is distinctly a surface phenomenon. There are occasions then, when physical treatment may be more important than composition itself. Where deep pitting or slight but uniform general corrosion takes place its progress may be determined by so simple a factor as mill scale remaining closely adherent on certain parts of an iron surface only, and again corrosion may be prevented entirely for a long period of time by thin tightly adherent mill scale.

(3) Oxygen.

Oxygen is shown in this paper to dominate over composition in determining the initial stages of corrosion, and, acting through the medium of the products of corrosion, in determining more than any other single factor its entire course. Water is, of course, always assumed to be present either continuously or intermittently. It is possible

[5] J. Newton Friend, The Corrosion of Iron and Steel, London, 1911, pp. 35 and 36, Whitney, J.A.C.S., 25, 394 (1903).

that some corrosion results which have been reported as due to composition of the metal may have been due and perhaps determined by the physical treatment to which the metal has been subjected. On the other hand, atmospheric air or oxygen and particularly the products of corrosion are able to overbalance physical treatment as they are composition.

In this discussion as elsewhere, only the ordinary types of iron and steel are under consideration. In dealing with alloys of iron such as nickel-iron alloys and silicon-iron alloys and others, wherein under ordinary circumstances there is little or no tendency toward corrodes, the same arguments will not apply or hold; but as pointed out above, the entire subject of corrodibility of series of iron alloys has not yet been undertaken.

(4) Products of Corrosion.

The products of corrosion are themseles great accelerators of corrosion just as mill scale is. This accelerating action is due first to the fact that the iron oxide formed during corrosion is strongly electro-negative compared to iron and when concerned in corrosion is always a cathode. Ferric oxide may also act as a depolarizer in corrosion since it is oftentimes reduced to Fe_3O_4. Its activity may be increased by condensation or adsorption of atmospheric oxygen on its surface, although Friend believes his experiments have disproved this. It also acts by absorbing and holding water.

After the commencement of corrosion, its subsequent course is determined very largely by the physical character of the rust formed, its distribution over and its adhesion to the surface of the metal. It may so act as to stimulate general corrosion. It may be responsible for deep pitting or under other circumstances may retard corrosion or prevent it altogether for considerable periods at least, by close adhesion over considerable areas. It may cause corrosion to take different courses at different times, due to the fact that the rust formed at one time may be loose and wet, later on tightly adherent and later still dry and hard so that by the influence of moisture or temperature or physical strain it scales off from large surfaces, thus exposing the metal beneath and the cycle is thus renewed. Altogether rust appears to be the main feature of ordinary corrosion, not only as a result, but as a causative agent. Rust itself is dependent for its formation upon atmospheric oxygen with the slight assistance of carbon dioxide and its physical characters are developed chiefly by the conditions of corrosion as shown in another part of this paper. The behavior of the rust formed may also be dependent upon the physical treatment to which the metal has been subjected and to the composition of the metal, so that the conclusion appears warranted that composition of the metal, at least among the ordinary varieties of iron considered here, does not influence the progress of corrosion directly, but rather indirectly through the behavior of rust and the relationship of the rust to the metal composition and surface.

Thus the products of corrosion or rust act in a full capacity, electrochemically as accelerators of corrosion and physically as a protective against corrosion. It is needless to point out that these two ways of functioning are diametrically opposed to one another, and it can easily be imagined how many types of corrosion and peculiarities and apparently unexplainable differences in corrosion might be due to this fact alone. It is one of the purposes of this paper to indicate that many of the discrepancies in results previously reported are due to the vagaries of the products of corrosion in influencing the progress of corrosion.

The Relative Importance of Composition, Oxygen and Iron Oxide in Influencing the Course of Corrosion.

It is shown in this paper that under ordinary circumstances atmospheric oxygen dominates over the composition of the metal in inducing corrosion of iron and that the after-course of corrosion is determined largely by the physical nature and adhesion of the products of corrosion which establish the principal electronegative areas on the metal surface. The relative importance of these three factors of corrosion and particularly the importance of composition, is therefore of paramount interest. If oxygen determines the commencement of corrosion, and iron oxide and other products of corrosion determine its subsequent course, of what possible influence can the composition of the metal be? Composition of the metal is the one factor which can be more or less controlled for a given service. It is unthinkable that composition should not have some influence on corrosion. It is well demonstrated that irons containing much silicon, for example, do not corrode under ordinary circumstances and are very nearly insoluble in the common acids. Iron containing much nickel is also practically non-corrodible. Ordinary cast iron under many conditions corrodes less than steel or mild steel. These are well-known facts and our theories of corrosion must take them into consideration.

Apparently composition of metal does not influence corrosion directly, if we consider the ordinary varieties of iron and steel used in experiments of Series 2. However, the composition of the metal evidently does influence the course of corrosion profoundly in an indirect way through the influence of the products of corrosion. We have seen that the products of corrosion may behave in three different ways in influencing the course of corrosion:

1. The rust formed may fall or scale off.
2. The rust may be partially adherent and an accelerator.
3. The rust may be protectively adherent.

Naturally there may be also some intermediate stages between these three principal divisions. The physical and electrical behavior of the rust are dependent upon two factors:

1. The conditions under which the corrosion takes place.
2. The composition of the metal.

Thus, of two different metals of different compositions but subjected to the same circumstances as regards corrosion, the rust in the one case may act as an accelerator of corrosion and in the other may tend to act rather as a protective coating. In other words, the rust may tend to adhere less in one case and more in another, over smaller areas in one case and over larger areas in another, and thus under the same conditions, one metal will corrode more and another of different composition will corrode less

The correlation between composition and the behavior of the products of corrosion on the basis of this theory of indirect influence of composition of the metal is most important, but requires a vast amount of work to bring it to a satisfactory and practical conclusion. If hydrogen is included as one of the products of corrosion, the phenomenon of polarization as a negative influence in corrosion should also be included; but, in this paper, by "products of corrosion" are meant the hydroxides, oxides and car-

bonates of iron produced during rusting in water and the salts and basic salts in salt solutions.

Corrosion of Polished Iron Surfaces.

A perfectly polished iron surface consists of a film of a pure iron spread over the entire metal surface and covering pure iron and impurities alike. The pure iron is apparently caused to flow in such a manner as to form a mirror-like film, under the influence of the polishing powder and the friction induced by the polishing mechanism, whether hand or machine. On such a polished surface of iron corrosion starts with some difficulty. Compared with ordinary smooth, clean iron and more particularly with rather rough but clean surfaces, the polished surface offers more resistance to corrosion. It is also less easily attacked by acid. As is often found to be the case in metallographic work, when etching the polished specimens the higher the polish the more difficult it is to start the etching. Nevertheless, if a drop of very pure redistilled water be placed on a highly-polished iron or steel surface and allowed to dry, a spot of rust will be left. As a rule, the higher the polish the smaller will be the amount of rust remaining, and since samples of pure iron or steel take a higher polish than cast irons, the rust spot on polished cast iron is usually more prominent than on polished pure irons or steel.

If a piece of iron, cast iron or steel is rubbed to a smooth surface with fine emery cloth or similar abrasive and a drop of water applied, the water will flow over the surface and adhere tightly to the metal. Rusting begins immediately at numerous points. On the other hand, if the same metals are polished to a high degree with perfectly dry and grease-free abrasives, a drop of water instead of spreading over the surface rolls up into a spheroid as though in contact with an oil-surface. If the metal is capable of taking a very high polish, rust formation begins slowly at a few points only and after the drop has dried only a small residue of rust remains, sometimes in the form of a narrow rim around the place where the drop stood. Less pure irons such as cast iron and semi-steel, which, as a rule, do not take as high a polish as pure irons and steels, also cause a drop of water to assume the spheroidal shape, but corrosion begins at numerous points and much sooner than in the other cases.

In such water-drop experiments the progress of corrosion can be followed by means of a microscope or hand lens, as the greenish-white ferrous hydroxide spreads outwardly through the water from the points at which the corrosion is occurring and gradually oxidizes to red rust. All of the samples of iron and steel used in Series 4 Experiments, described further on, were polished by means of dry abrasives as they would be for metallographic work, except that the polishing was carried to a higher degree, and a drop of water was placed on each. The rolled metals, consisting of copper-bearing irons, open-hearth pure irons, ordinary open-hearth and Bessemer irons, began to rust slowly from one or a few centres or nuclei and the total rusting as the drops dried did not amount to much. The puddled irons rusted more and from more centres. The cast metals, consisting of gray cast iron, semi-steel, white iron and malleable iron, rusted from numerous points, while the cast steels rusted from rather more points than did the rolled metals.

The principal difference between the rusting of the rolled metals and of the cast metals was in the number of centres or nuclei from which rusting proceeded. In the case of all the rolled metals the centres were few, in the case of the cast metals numerous, while the cast steels behaved more like the rolled metals. If after a rust spot has been formed on a well-polished surface of iron or steel, where in the first instance the rusting has proceeded slowly, another drop of water be so placed over the rust spot that it covers not only the spot but a portion of the unrusted polished surface as well, it is noticeable that the water flows over and adheres readily to the rusted portion, but, as before, not to the polished surface. The rusting now proceeds much more vigorously than in the first instance. Green ferrous hydroxide can be seen forming between and among the particles of red rust and also from the polished surface outside of the borders of the rust spot. It is noticeable that more rust forms from the polished surface near the rust spot than away from it. After the second drop of water has dried, greenish black areas are noticeable among the original grains of reddish rust and suggesting the possible origin of the magnetic oxide of iron formed under some conditions of corrosion.

After corrosion tests on polished surfaces, whether either plain water or the ferroxyl indicator in agar is used to cover an area of several inches square or more, it usually happens that there are more and larger electronegative areas left with their original bright polish, on highly-polished and comparatively pure samples than on less polished and comparatively impure samples.

The fact that the highly-polished surface of iron starts to corrode more slowly than the less polished surface, such as that of cast iron or relatively less pure metal, might seem to hold out a faint hope that extreme purity of metal, if possible of attainment in a practical way, would be a means of reaching the much-desired goal of corrosion-resisting iron. However, this hope does not seem warranted by the facts. Very pure open-hearth iron corrodes in the presence of oxygen more rapidly than cast iron. Electrolytic iron corrodes readily. Even highly polished surfaces corrode slightly in the beginning and after the first rust spot is formed, at an accelerated rate. So long as oxygen is the dominating influence which governs the commencement of corrosion, and rust and oxygen together control the subsequent course so largely, neither pure iron nor polished surfaces appear to offer the solution of the problem.

(To be continued.)

MERGER OF FIVE CHEMICAL CONCERNS.

The merger of the General Chemical Company, Barrett Company, National Aniline & Chemical Company, Solvay Process Company and Semet-Solvay Company, which has been so widely discussed in financial and industrial circles throughout the summer, seems at last about to become a definite reality, according to a statement made by Mr. W. H. Nichols, chairman of the Board of Directors of the General Chemical Company, the approval of the plan by the respective boards and by the stockholders of the five companies remains to be obtained, but that it will be forthcoming is held almost certain on the basis of Dr. Nichols' declaration that "the chief executive officers and certain large stockholders have approved a general plan for submission to their respective boards for the consolidation of these five companies through an exchange of shares based on present capitalizations."

OVERSEAS NOTES.

(Special Correspondence to Canadian Chemical Journal.)

The Proprietary Medicines Act, recently passed in the United Kingdom, makes provision for the establishment of a register of proprietary preparations and appliances, and the owners thereof. No unregistered products are to be sold, and severe restrictions are to be put upon those which are registered.

The Annual Report for 1919 of the German Benzol Federation states that the output was generally low, and declined in April to 4,000 tons of 90 degree benzol, the smallest figure for over ten years. Deliveries amounted to: 90 degree benzol, 78,077 tons; toluol, 3,739 tons; solvent benzol, 13,366 tons; a total of 105,182 tons, so that, including the quantities consumed by the makers, the total production was only 118,056 tons. Up to May, 1919, the price was kept at the 1915 figure, namely, 55 marks per 100 kilogrammes, ex works, and was then raised to 100 marks, as compared with 400 to 700 marks demanded in the open market.

From the Annual Report just issued for 1919 of the Chief Inspector under the Alkali Act for the United Kingdom, it appears that the number of works registered by his department during that year was 1,568, as compared with 1,580 in 1918. In many works more than one separate process is carried on, and the number of separate plants under inspection was 2,288, compared with 2,352 in 1918, and 2,326 in 1917. As regards the more important processes the following table shows the position:

Works in Operation.

	1917.	1918.	1919.
Sulphuric acid	147	146	140
Sulphuric acid (Class II.) ...	137	138	116
Nitric acid	101	96	83
Sulphate of ammonia	634	632	632
Chlorine	30	32	25
Picric acid	21	15	5
Tar	360	375	376

Adverse conditions, due to difficulties with respect to labor, transport and material, continued throughout 1919, but much was done in effecting repairs, extensions and erection of new plant, so that the general state of plant in the works may be said to be resuming the normal conditions of past years.

The British Empire uses 6,000,000 tons of oil every year, but produces only 2,000,000 tons.

The German Economic Union for South and Central America reports a special demand in Mexico for drugs and chemicals.

South African reports would appear to indicate that the problem of discovering a satisfactory alternative to gasoline for motor fuel has been, or is in the process of being solved, by the use of a new product called "Acetol," the chief constituents of which are acetylene gas and industrial alcohol. In a series of trials by experts in the Union the new spirit has given remarkably encouraging results, not the least satisfactory of its qualities being its astonishing pulling power on high gradients. The spirit is reported to have as an additional merit security of handling, as it does not explode in bulk when exposed to a naked light, and when burning can be extinguished with water. This reduces risk of storage to a minimum, and makes it possible to contemplate the development of storage deposits where supplies can be held and drawn upon in bulk instead of in cans. The experimental work on the new spirit has been mainly carried on in the Government Research Laboratory at Cape Town, but the product is shortly to be placed on the market as a commercial venture at a price considerably less than that ruling in South Africa for gasoline, which is almost a dollar per gallon at the present time.

Raw Material for Power Alcohol.

In connection with the search for a satisfactory substitute for gasoline, it is reported that in the Pacific Islands alone maize, cassava and sugar cane could be grown and utilized to an extent which should produce 50,000,000 gallons of power alcohol annually, and it is believed that the entire world demands could be filled by raw material produced in certain areas all within the British Empire. Estimates of the cost of obtaining industrial alcohol from the crops named indicate that ten cents per gallon is a figure which might be realized, and the process of distillation should be associated with the recovery of valuable by-products. Even when the cost of overseas transport to the centres of manufacture is added to the cost of production it is felt that the fuel could be placed on the market at prices which would compare favorably with the cost of gasoline, in the United Kingdom at all events.

United Kingdom Chemical Market.

Business during the first week of September was very quiet, there being a continual falling-off on export orders resulting in a fall in prices. There is no disposition to book forward, and there will be no improvement so long as the uncertainty regarding coal supplies continues. The chemical manufacturers are heavy consumers of fuel, and, having their works close to the source of supply, there has hitherto been no necessity for the provision of extensive storage accommodation. A coal strike in the United Kingdom, if it should unhappily prove impossible to bring the two sets of disputants together, would soon bring the British chemical industry in all its branches to a complete standstill. A very general opinion is that there will be a distinct revival, in the home market at all events, if the miners can be persuaded to call off the strike.

Chinese Tung Oil for Varnish Manufacture.

A British firm has established a refinery at Hankow to produce from the nut of the tree, Aluretis Cordata, of Central China, or the Aluretis Molucana, of South China, an oil which is stated to be of great value in the manufacture of varnishes, aeroplane dope, and for the stiffening of fabrics.

Japanese Chemical Market.

Japan is now manufacturing most of the heavy chemicals she requires for industrial use, and in many branches is taking a place as a competitor in foreign markets. Those chemicals which are not yet made there in sufficient quantity to meet the domestic demand include 60 per cent. caustic soda, glycerine, salicylic acid, yellow phosphorus, formaldehyde, aniline salt, acetate of lime, sulphate of ammonia and carbolic acid.

German Dyestuffs.

The importation of German dyestuffs into the United Kingdom is now free and unrestricted. There is, however, very little offering in the German home market, and where prices are quoted they are said to be astonishingly high. The shortage of dyestuffs and of most other chemicals in Germany is stated to be due to scarcity of coal. The pigment and dye industries have found it necessary to combine, the German Bunt-und Min-

eral Farbene Industrie and the Union of German Dye Industries being formed. These organizations are arranging for the allocation of raw materials and the establishment of fixed prices, putting an end to profiteering. The German drug industry is suffering excessively from a shortage of raw materials and coal, and many small factories have closed down.

Radium Recovery From Gunsights.

The Report of the Government Chemist of the United Kingdom mentions that arrangements were made at the Government Laboratory to extract radium from many thousands of luminous dials, compass cards, gunsights and similar materials, and to convert it into a form suitable for further use. The matter was in this instance complicated by the presence of the overwhelming proportion of paint with which the radium was mixed for use on the dials, etc. Practically all the radium present in the paints is being recovered in a usable form and at a comparatively small cost.

Motor Fuel Research at Manchester University.

Under the direction of Professor Harold B. Dixon, D.R.S., an important programme of research is being undertaken at the Manchester University, extending to a variety of comparative tests to determine the behaviour of alcohol vapor and vapors of alcohol-benzol mixtures after firing. The chief object in view is to ascertain the conditions of combustion and other factors which conduce to the maximum power and efficiency from existing internal combustion engines when run on these mixtures. It is also hoped to secure data which will be of value to designers of new types of engines.

Gasoline Substitutes—Carburettor Trials in Germany.

The Allgemeine Deutsche Automobil-Club, in conjunction with the German Ministry of Munitions, have recently submitted fifteen carburettors to a road test on a four-ton Daimler lorry and a bench test at the Dresden University. The fuels used were benzol, benzol-petrol mixture, and benzol-lignite tar oil mixture. Summarizing the results of the test, it appears that the multiple jet design carburettor has not proved successful for heavy fuels, and that a combined vaporizing and float chamber can be constructed without impairing the accessibility and ready replacement of both jets and choke. There appears to be very little doubt that perfect carburation is more a question of atomization than of vaporization, and that in a comparatively short time it will be possible not only to burn heavier fuels with comparative ease, but also to decrease fuel consumption at the same time. There is good reason to believe that eventually all types of internal combustion engines should give out the same horse-power for unit weight of fuel—whatever the grade of fuel most suitable for each particular type—and that it should be possible to make up for any loss due to lower efficiency, thermal, mechanical or otherwise, by the relative heating value of heavy and light fuels. The petrol engine is passing into a new stage of development, and in a few years the carburettor of to-day and the magneto will be things of the past.

APPOINT CANADIAN REPRESENTATIVES.

Darwin Chemical Company, Elizabeth, N.J., announce that they have designated T. E. O'Reilly, Limited, Toronto, as their Canadian representatives on certified food colors. T. E. O'Reilly, Limited, will sell exclusively for Darwin Chemical Company.

BRITISH INDUSTRIES FAIR, 1921.

The three fairs, although held in different towns (London, Glasgow and Birmingham), are in reality only sections of one fair, and together constitute the greatest Trade Fair in the world. The London Fair is directly organized by the Imperial Department of Overseas Trade on behalf of the British Board of Trade, while the fairs in Birmingham and Glasgow are organized by the municipalities of the respective cities under the auspices and with the support of the British Board of Trade. An important point in the organization of the three fairs is that they are held practically concurrently, and that each fair represents a specified group of industries. No industry is permitted to exhibit at two fairs, and consequently the buyer knows that at whichever fair he may be visiting he will find the whole range of exhibitors in any particular trade or trades. Further, by careful arrangement of the dates of the sections it is made easy for him to visit all three should he wish to do so, for while the London and Birmingham Fairs run concurrently from the 21st February to the 4th March, the Glasgow exhibit opens a week later on the 28th of February.

The British Industries Fairs are not exhibitions. They are trade fairs to which admittance is restricted to bona-fide trade buyers seriously interested in the participating trades. Only British manufacturing firms are allowed to exhibit, and no exhibitor is permitted to exhibit goods other than those of his actual manufacture. The result is that buyers who visit the fair know that no articles shown on an exhibitor's stand can be purchased elsewhere in the fair.

Buyers from the Dominion, who wish to visit the fair, should apply as early as possible to the nearest British Trade Commissioner from whom they will be able to secure full information. Their names and addresses are: Captain E. J. Edwards, H. M. Senior Trade Commissioner, 248 St. James street, Montreal; F. W. Field, H. M. Trade Commissioner, 260 Confederation Life Building, Toronto, Ontario; L. B. Beale, H. M. Trade Commissioner, 610 Electric Railway Chamber, Winnipeg, Manitoba.

On their arrival in England it would be to their advantage to communicate at once with the Secretary, British Industries Fair, 35 Old Queen street, London, S.W. 1, England, or, should the fair have commenced, at the White City, Shepherd's Bush, London W. 14, England. Full details of the Birmingham Fair may be obtained on application to the General Manager, British Industrial Fair, Chamber of Commerce, 95 New street, Birmingham, England. For the Glasgow Fair enquiries should be addressed to J. M. Freer, Esq., Kelvin Hall, Glasgow, Scotland.

CANADIAN FIRM ESTABLISHES UNITED STATES BRANCH.

Reversing the usual procedure, a Canadian firm, Pressed Metals of Canada, Limited, has established a plant at Marysville, Mich., about four miles south of Port Huron. Pressed Metals have organized an organization known as International Bushings, Ltd., the American subsidiary of which is the American Bushings Corporation, with plant at Marysville. The entire output of the first plant unit at Marysville has already been sold to the Ford Motor Car Company. The principle used by Pressed Metals during the war for the manufacture of shrapnel tubes was later applied by the company for the making of bushings for motor cars, and recognizing that the big field for bushings was in the United States, the plant at Marysville was erected, an American corporation having, of course, to be formed to operate it. The average light motor car requires twenty-six bushings of different designs.

The Imperial Oil Company will erect a distributing plant at Brandon, Manitoba, at a cost of nearly $300,000. It is intended to erect the plant during 1921 and to have it ready for the busy season in the autumn.

Review of Canadian Paint, Varnish and Starch Industries

Production Figures of these Industries Prepared by the Dominion Bureau of Statistics, Show Progress Being Made*

THE PAINT AND VARNISH INDUSTRY IN CANADA IN 1918.

Forty-five establishments making paints or varnishes or materials destined for use in the paint and varnish industry, were in operation in Canada during 1918. The total assets of this industry, including the value of the land, buildings, fixtures, machinery, tools, materials and finished products on hand, together with the operating and trading capital aggregated $15,784,610.

The principal materials used in this industry were valued at $9,203,530, and from them principal products to a value of $17,678,049 were made. Thus the value added to the materials used, by the process of manufacturing, was $8,474,519. Miscellaneous expenses chargeable to manufacturing operations were $2,315,881.

The extensive use of zinc oxide and lithopone as paint pigments is reflected in the figures shown below. Basic carbonate white lead is still used in larger quantities than any other one pigment, but recent advances in the study of paint pigments have shown that zinc oxides and lithopone are very desirable pigments for certain uses.

Raw materials used in the industry are itemized in Table 1, to show quantities and cost.

TABLE I.—MATERIALS USED IN THE PAINT AND VARNISH INDUSTRY IN CANADA IN 1918.

	Quantity.	Value.
Oils—		
Chinese wood oil, gals.	257,620	$ 594,855
Linseed oil, raw, gals.	1,297,727	1,963,110
Thinners and Solvents—		
Alcohol, gals.	138,558	179,618
Creosote, gals.	53,073	13,747
Naphtha, gals.	904,673	286,053
Turpentine, gals.	426,344	319,592
Acetone, lbs.	42,213	15,932
Benzine, paraffin, etc., lbs.	2,863,110	166,711
Benzol, lbs.	338,639	16,133
Gums and Resins—		
Gums, lbs.	1,759,941	417,434
Resins, lbs.	3,598,292	174,912
Pigments and Driers—		
Acetate of lime, lbs.	20,845	1,480
Zinc oxides and Lithopone, lbs.	7,198,248	721,527
White lead, lbs.	1,462,636	168,255
Colors and pigments, lbs.	.....	1,233,695
Fillers—		
Asbestine, lbs.	3,739,230	24,325
Barytes, lbs.	4,326,670	76,278
Whiting, lbs.	8,422,276	116,817
Pig lead, lbs.	10,593,351	874,638
Other chemicals	.....	210,020
Containers and other materials	.....	1,628,398
		$9,203,530

In 1918 three firms in this industry corroded pig lead to make dry white lead and white lead ground in oil. 10,593,351 pounds of pig lead, valued at $974,638, were used in the production of white lead, dry, and in oil, and litharge. Practically the whole of this was made by the "quick process." The quantities made, with their respective selling values, were:

Item.	Quantity.	Selling Value.
White lead, dry	4,030,367 lbs.	$ 473,922
White lead in oil	8,456,236 lbs.	1,083,552
Litharge	1,421,686 lbs.	266,974

Six other establishments used 1,171,651 pounds of white lead, dry, costing $132,736, for the preparation of 941,013 pounds of white lead ground in oil, having a sales value at the factory of $136,578.

7,483,893 gallons of paints in oil, prepared ready for use, were reported as being manufactured during the year. The total selling value at the plant was stated to be $8,613,973.

A study of white paints carried out during the year in the Laboratories of the Department of Trade and Commerce showed that 73 different brands were being offered for sale on the Canadian market. The composition of each was carefully determined and it was found that a great variety of formulaes were in use. As pigments, basic carbonate white lead, basic sulphate white lead, leaded zinc, zinc oxide, and lithopone, were found, while barytes, blanc fixe, satin white, whiting, asbestine and silica were often present as fillers, sometimes to quite a considerable extent.

The production of varnishes in Canada increased from 1,577,009 gallons in 1917 to 3,317,069 gallons in 1918, the respective selling values rising correspondingly from $2,117,000 in 1917 to $3,764,555 in 1918.

TABLE II.—PRODUCTS MADE IN THE PAINT AND VARNISH INDUSTRY IN CANADA IN 1918.

	Quantity.	Value.
Linseed oil, boiled and refined (sold) gals.	113,256	$ 211,335
Paints in oil (ready for use) gals.	7,483,893	8,613,973
Paste paints, lbs.	33,500	3,460
Colors in oil and japan, lbs.	27,800	5,142
Varnishes, all kinds, gals.	3,317,069	3,764,555
Japans and lacquers, gals.	209,249	251,856
Shellac, gals.	81,704	309,975
Stains, gals.	216,274	275,665
Dryers, gals.	105,868	105,401
White lead, dry, lbs.	4,030,367	473,922
White lead, in oil, lbs.	11,874,260	1,545,918
Lampblack and other carbon black, lbs.	62,939	6,878
Oxides of lead (litharge, red lead, etc.), lbs.	2,432,936	268,624
Iron oxides, lbs.	748,750	44,925
Dry colors, lbs.	335,000	76,926
All other pigments, lbs.	3,535,213	404,770
Barytes, lbs.	1,236,000	12,400
Putty and other fillers, lbs.	5,178,405	280,581
Asphalt, pitch and tar products	.....	38,463
All other miscellaneous products	.....	982,280
		$17,678,049

Exports from Canada of paints, varnishes, and materials used in the paint and varnish industry during 1918 were valued at $2,112,113.

Imports into Canada during 1918 of paints, varnishes, and raw materials used in the industry were valued at $6,309,836.

The paint and varnish industry is firmly established in Canada and is making rapid progress, but that there is still great need for protective painting is evidenced by the large number of unpainted structures throughout the country. The very laudable campaign conducted by the paint and varnish makers, under the slogan "Save the surface and you save all" should have splendid results, and should make for a considerable national economy in building materials.

The survey of the paint and varnish industry for 1919, now in process of compilation, will review the industry in better detail than has been possible heretofore.

THE STARCH AND GLUCOSE INDUSTRY IN CANADA in 1918.

The starch and glucose industry in Canada included 12 establishments in 1918 and the same number in 1917. The value of the total assets of the industry increased from $3,670,806 in 1917 to $3,784,664 in 1918, or 3 per cent. In-

*Prepared under the direction of S. J. Cook, chief of the Mining, Metallurgical and Chemical Section of the Dominion Bureau of Statistics.

cluded in this total is the value of the land, buildings, fixtures, machinery, tools, materials on hand, stocks in process, finished products, fuel and miscellaneous supplies, which decreased from $3,218,216 in 1917 to $3,112,311 in 1918. This leaves the increase in the cash and trading accounts at $219,763, or 48 per cent.

Table I. gives the quantities and values of the materials used in the starch and glucose industry in 1918, itemized as to quantity and value at the factory.

TABLE I.—MATERIALS USED IN THE STARCH AND GLUCOSE INDUSTRY IN 1918.

	Quantity.	Value.
Corn, lbs.	139,974,408	$3,858,212
Potatoes, lbs.	9,923,279	106,064
Corn Starch, lbs.	503,950	32,495
Sugar and Syrup for mixing, lbs.	1,657,082	113,399
Containers of all kinds	.....	750,560
Chemicals	.....	44,763
All other miscellaneous materials	.....	87,112
Total		$4,992,705

Corn starch was used in one factory to make dextrine exclusively, but in three other plants it was also used for the manufacture of glucose and dextrine, so that it is not possible to determine the amount of starch utilized in the manufacture of either of these products. The principal commodity in the item "Chemicals" is hydrochloric acid, which is used principally for the manufacture of glucose by the hydrolysis of starch.

Table II. gives the selling value at the works of all the products and by-products manufactured during the year. From these two tables the value added by manufacturing can be determined, and it is found to be $2,796,037.

Table II. Products of the starch and glucose industry in 1918:

TABLE II.—PRODUCTS OF THE STARCH AND GLUCOSE INDUSTRY IN 1918.

	Quantity.	Value.
Corn Starch, lbs.	19,041,506	$1,445,324
Laundry Storch, lbs.	4,820,377	391,456
Potato Starch, lbs.	2,055,472	177,353
Chinese Starch, lbs.	1,263,227	122,284
Glucose (including all syrups), lbs.	64,803,113	4,191,098
Grape Sugar, lbs.	688,378	37,392
Corn Oil, gal.	242,451	404,659
Stock Feed, tons	14,510	796,349
Dextrine, lbs.	655,070	54,949
Total		$7,620,864

Corn oil is made by pressing the germ of the common Indian corn. By refining and deodorizing it with superheated steam, an edible product may be obtained. This grade of oil is used in cake and biscuit-making and for oiling bakers' pans. It is also used in the manufacture of oleomargarine and as a salad oil. Hydrogenated corn oil is a satisfactory stiffening agent for lard substitutes, and is extensively used in soap-making. Although the output is not large, it is finding a ready market, and the probability is that the production and consumption of corn oil will be greatly increased within the next few years.

Table III. gives the quantities and value of materials imported in 1918, which are of interest in connection with the starch and glucose industry.

Table III. Imports for the starch and glucose industry.

TABLE III.—IMPORTS FOR THE STARCH AND GLUCOSE INDUSTRY.

	Quantity.	Value.
Corn, Indian, not for purposes of distillation, lbs.	609,752,136	16,709,904
Potatoes, N.O.P., lbs.	40,950,180	705,281
Starch, including corn starch, potato starch, potato flour and all preparations having the qualities of starch, lbs.	2,434,281	144,125
Glucose or grape sugar, glucose syrup and corn syrup, or any syrups containing any mixture thereof, lbs.	2,852,516	169,362
		$17,728,672

The first two items in this table, namely, "Corn" and "Potatoes," are Customs items giving the importations of these commodities for various purposes. Most of the corn imported under this item was used for feed, and a little of it for seeding purposes. Table I. shows the amount of corn used for making starch, regardless of whether its origin was domestic or foreign. The potatoes imported probably represent a reciprocal trade along the border between the United States and Canada, and it is not likely that any considerable quantity of imported potatoes was used in the manufacture of starch. In 1918 Canada exported 827,716 pounds of starch valued at $26,790.

The apparent consumption of starch in Canada may be determined by adding the quantity imported to that manufactured, and deducting the exports. This computation shows that 22,842,582 pounds of starch of all kinds were used in Canada in 1918. All the potato starch was produced in seven plants in which this commodity was the only product. Three establishments made corn starch from corn and produced corn oil as by-product. One firm made only Chinese starch, while another made dextrine exclusively.

TRADING WITH HOLLAND.

The following table gives a good idea of the amount of chemicals and allied products imported by Holland from Canada and the United States. As at present most Canadian goods reach Holland via New York or Antwerp, the Dutch trade returns credit them to the United States or Belgium, consequently the imports from the U. S. include Canadian shipments via New York, and are a good indication of the market for Canadian goods there:

	From United States and Canada		From all Countries	
	Total fiscal year, 1919 Wt. in Kg.	Jan.-Mar. 1920 Wt. in Kg.	Total fiscal year, 1919 Wt. in Kg.	Jan.-Mar. 1920 Wt. in Kg.
Calcium acetate	323,577	1,000,774	781,233	1,055,838
Lead acetate	11,868	.....	49,969	24,069
Acetone	11,129	.....	35,603	4,832
Wood alcohol and methylated spirits	13,250	.....	31,523	14,975
Toilet waters and perfumes	31,033	4,243	338,422	155,766
Essential oils except turpentine	4,222	2,750	375,796	69,755
Caustic soda	5,253	1,064,207	5,349,705	4,592,229
Soda, calcined	.....	1,849,998	17,933,551	4,791,187
Potash, not caustic	438,323	.....	1,734,092	507,738
Borax	182,956	.....	883,532	255,033
Copper sulphate	173,891	.....	516,270	92,533
Gases, liquid and compressed except carbolic acid	.....	340	110,581	52,807
Saccharine	6,992	14,947	28,831	25,036
Printing ink	44,825	3,477	365,204	156,720
Celluloid and waste	5,750	5	9,638	4,340
Films	5,965	900	30,080	12,116
Gelatine and articles thereof	5,115	5,230	64,657	12,827
Medicines, not quinine, opium and cocaine	37,025	2,929	602,313	194,554
Chemical products, n.o.p.	444,863	144,962	13,183,397	6,073,844
White lead	181,284	109,204	1,417,037	482,425
Paint stuffs, n.o.p.	47,732	19,972	2,248,632	926,015
Dryers and varnishes	38,389	14,124	233,130	58,904

WILL DEVELOP MICA MINE.

The old mica mine at Blue Mountain, near the head of Stony Lake, Ontario, has been purchased by American interests. Operations have commenced and the company expect to ship 100 pounds a day before the end of the present season. The mica will be transported by motor truck to Stony Lake, thence to Lakefield in barges.

CANADIAN FERTILIZER INDUSTRY EXPANDING.

The business of making fertilizers in Canada is growing. In 1917 there were 12 companies in Canada making commercial fertilizers, exclusive of the meat-packing plants, while to-day there are 15. During 1918 the value of fertilizers used in Canada was $4,408,330. The 1918 output included 27,985 tons of complete fertilizers, 10,934 tons of ammoniated fertilizers, 27,384 tons of basic slag, and 7,320 tons of other fertilizers.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Alkaline Accumulators.

A. M. Cave, 201977, July 20, 1920. An electrode for accumulators, comprises a perforated metal plate, wrapped with metallic cloth, active material filling the interstices in the cloth, an insulating envelope permeable to gases covering the cloth and bands of vegetable tissue enwrapping the envelope.

Steel,

F. E. Falvet, 201921, July 13, 1920. In making high-speed or special steel the necessary quantities of Fe, Va, W or other materials are heated together to about 1,200°, a quantity of ferro or ferri-cyanide or K or Na is added and the temperature raised to about 1,800° before casting. A chloride may be added to assist in the formation of slag.

Iron or Steel Castings.

F. E. Falvet, 201920, July 13, 1920. In making foundry castings a quantity of ferro or ferri-cyanide of K or Na is added to the molten metal shortly before pouring into the moulds and a further quantity may be added in the moulds.

Extracting Copper from Ores.

N. Evans, 196453, July 20, 1920. Ground Cu ore is subjected to the action of an aqueous solution of niter cake whereby $CuSO_4$ is formed and the Cu is recovered from the solution.

Fire Extinguishing Compound.

Henry R. Frey, 201554, July 6, 1920. The compound comprises $NaHCO_3$, umber, yellow ochre and red oxide of Fe.

Aluminium Hydroxid and Potassium Carbonate from Feldspar.

J. N. Robinson, 202248, July 27, 1920. Feldspar, an alkali earth metal carbonate and an alkali metal carbonate in finely divided form are mixed, formed into briquettes, and heated to a red heat, such as will not volatilize the alkali. The mass is then ground to a fine powder, treated in the presence of hot water with CO_2; the alumina is removed by filtration, the Na_2CO_3 by evaporation, and the residual solution is evaporated to dryness.

Waste Soda Liquors.

V. Drewsen, 201865, July 13, 1920. Waste liquor from soda pulp process is heated under pressure and treated with CO_2 to remove ligneous substances concentrated and causticized with lime to obtain a dry mixture, which is then aggregated by treatment with CO_2 and moisture, heated to 160-200° and leached with a small amount of cold water to recover Na_2CO_3.

Potassium from Potassium Bearing Silicates.

Allan Grauel, 202193, July 27, 1920. Silicates are heated to liberate the K in a fume which is drawn by vacuum into a heated saturating fluid to effect the saturation of the K particles. The vapors rising from the heated fluid contain the K and are condensed and finally evaporated, leaving the K in a pure state. To obtain KCl, $CaCl_2$ or NaCl is added to the furnace charge, or to obtain the sulphate, gypsum is added.

Purifying Aluminous Material.

Lewis E. Saunders, 198582, March 23, 1920. Aluminous material is fused in the presence of sufficient C to effect a substantial reduction of the Al_2O_3, the impurities are separated and the reduction products of Al_2O_3 are reoxidized in an electric furnace with such a quantity of bauxite that the non-aluminous oxides thereof are in excess of the quantity necessary for the reoxidation.

Processes of Obtaining Combined Potassium from Minerals.

S. R. Scholes, 202349, July 27, 1920. K bearing silicates are mixed with an alkali carbonate and heated until fusion takes place and all the volatile gases are driven off. The fused mass is ground and treated with CO_2 in the presence of hot water until the required K_2CO_3 separates out.

Manufacture of Organic Solvents.

Chas. Weizmann and D. A. Legg, 202135, July 20, 1920. Secondary butyl alcohol is produced by mixing butenes with a strong acid at a suitable temperature and separating the product by distillation.

Production of Benzaldehyde.

Jno. M. Weiss and Raymond Downs, 202286, July 27, 1920. A mixture of toluol vapors and an O containing gas is passed through a reaction zone containing an oxide of Mo at above 500°.

Synthetic Production of Ammonia.

Harold C. Greenwood, 201366, June 29, 1920. H and N are passed through the catalyst space at a velocity of the order of a million litres (measured at ordinary temperature and pressure) per hour per litre of catalyst space.

Ammonium Nitrate.

F. Uhde, 201894, July 13, 1920. NH_3NO_4 is produced from coal distillation gases by separating the tar, but not the water, vapor from the gases while still hot, conducting the gases into an alkaline earth nitrate solution at 100°, filtering the solution and evaporating to produce the salt.

Extraction of Potash and Alumina from Feldspar.

H. G. Wildman, 201790, July 13, 1920. Finely divided feldspar is heated to about 300° with an alkaline solution and treated with SO_2. The SiO_2 is removed by filtration and the K and Al_2O_3 recovered from the filtrate.

Process of Extracting Potassium Salts.

Robert S. Edwards, 202320, July 27, 1920. A mixture of silicate, NaCl and a hydrated base is heated to fusion point, the NaCl being in excess of the molecular equivalent for replacement of the K in the silicate. The hydrated base may be omitted and the fusion caused to take place in the presence of intimately associated steam.

Electrolysing Solutions of Nickel Salt.

Christian Heberlein, 202010, July 20, 1920. A continuous cyclic process for the production of Ni using insoluble anodes, consists in dissolving Ni in an acid until a liquor containing the required optimum acidity for electrolysis is obtained, using the liquor as a catholyte and circulating it through the cathode compartment of vats in series and using as anolyte Ni salt solution which circulates through the anode compartments of the vats in serial order, the circulation of the catholyte and anolyte being continued until the acidity of the anolyte has reached a degree which would be incompatible with the maintenance of the optimum acidity of the catholyte, whereupon the anolyte is withdrawn in the desired quantity to be used for preparing fresh Ni salt solution, the catholyte being returned into the catholyte circulation, in admixture with the fresh Ni salt solution so as to obtain a catholyte liquor of optimum acidity.

Chrome Alum.

Gustaf H. Hultman, 202425, August 3, 1920. Ferro chrome is finely ground and dissolved in H_2SO_4 and a soluble K salt is added to the solution, preferably in the presence of Pb.

Process and Apparatus for Reclaiming Waste Products in the Manufacture of Wood Pulp.

Hugh K. Moore and Jno. T. Quinn, 202528, August 3, 1920. Black liquor is heated to a vaporizing temperature while under a pressure greater than its vapor pressure at such temperature to generate an explosive force therein. The liquor is then liberated in a spray of finely disrupted particles, the liquid content evaporated and the combustible content of the particles burned. The explosion occurring on the liberation of the liquor causes disintegration of the viscid material into minute particles so that the water is evaporated and the particles burned while in transit. The use of foreign fuel is unnecessary as the combustion of the combustible content of the liquor in transit and as it reaches the furnace floor furnishes heat for the evaporation of the water content. Apparatus is also specified.

Production of Black Upon Vegetable Textile.

E. A. Fourneaux, 201775, July 13, 1920. Metaphosphate of aniline is used in place of the greater part of the aniline salt used in excess of the proportion required to convert the prussiate into prussiate of aniline. Aniline and boracic acid may be used or a mixture of these with the metaphosphate of aniline.

MONSANTO ESTABLISHES CHICAGO BRANCH.

Monsanto Chemical Works announces the establishment of a Chicago branch in the Marine Building, 209 North LaSalle Street.

This branch is opened with a view of serving their customers in Chicago and surrounding territory more efficiently than could be done from St. Louis.

A complete stock of the products manufactured by Monsanto Chemical Works will be carried at this branch, which will be managed by Mr. W. L. Filmer, who previously had charge of the Flavors and Condiments Division of the St. Louis sales department.

Mr. G. T. Grover, formerly of the Toronto office, is now in charge of the Montreal office of T. E. O'Reilly, Limited, 207 St. James Street.

Government Publications

By S. J. COOK

Department of Agriculture.

Circular 27. Yield and Relative Value of Some Dairy Products. 4 pp. Interesting tables showing the yield of Canadian chedder cheese and butter from 100 pounds of milk for varying percentages of fat content; also the prices which must be obtained for cheese and butter to give the same net return for one hundred pounds of milk testing 3.5% fat.

Department of the Naval Service.

Quarterly Bulletin of Sea Fishery Statistics. January-March, 1920. Eleven pages of data on the catch and distribution of sea fish by Provinces, and for the United States, Newfoundland, Great Britain, and Norway.

Dominion Bureau of Statistics.

Trade between Canada and the British West India Colonies. 150 pp. The Canada-British West India Conference, held at Ottawa in June of this year, were supplied with copies of the booklet now reviewed in which tables setting forth the various phases of trade between the islands of the British West Indies and Canada are given. A historical summary covers the trade as far back as 1880. Imports from and exports to the B. W. I. Colonies are given in a second table. The principal items of the trade of the Indies themselves are tabulated, and supplementary tables show the trade situation in regard to certain specific items. The Canada-West Indies Trade Agreement of 1912 is given in full and the whole publication is carefully indexed.

Department of the Interior—Dominion Water Power Branch.

Water Resources Paper No. 3. 2 vols. Winnipeg River Power and Storage Investigations. By J. T. Johnston. Volume One. 511 pp. 77 illus. 89 plates. 102 tables. The tremendous importance to Canada of the development of her water powers is emphasized regularly by the appearance of reports from the Dominion Water Power Branch, dealing with the work of conservation as it has from time to time advanced. The present report makes very interesting reading to any one desirous of making use of the water powers of district surveyed, and to the general reader it brings much of educational value.

Water Resources Paper No. 23. Hydrometric Survey of British Columbia, for the Climatic Years 1916-17 and 1917-18. 328 pp. 1 map. 1 fig. This volume is the sixth report presenting data of stream flow in the Province of British Columbia. The work of collecting data on the streams of British Columbia was commenced in 1911 by the Dominion Water Power Branch, and in 1913 the scope of the work was broadened and the Province took a share in the work, the same being carried on since that time under the name Hydrometric Survey of British Columbia. Daily and monthly figures of stream flow data are available in this report.

Department of Mines.

Graphite Bulletin No. 511. 202 pp. 56 plates. 43 figs. 6 maps. By Hugh S. Spence, M.E. This very complete monograph on the subject of graphite is intended to replace Report No. 18, of the Mines Department, which was published some years ago and has now been out of print for some time. The writer begins the story with the earliest known historical data relating to graphite and comes down to date. The geology of graphite deposits is treated at length and the deposits in Canada are discussed by location. Chapters are included on concentrating and refining, uses, world sources, and assay of carbon content of graphite, and on the manufacture of artificial graphite. The Canadian industry is reviewed, and a bibliography is appended giving the references to Canadian graphite in the literature.

Report on Some Sources of Helium in the British Empire. By J. C. McLennan, Ph.D., F.R.S., and Associates. 72 pp. 1 plate. 20 figs. 4 maps. The work done by Professor McLennan and his associates during the war, on the helium content of natural gases is so well known that a review of the bulletin in which the results of that investigation are recorded seems hardly necessary. By permission of the British Admiralty, the data have been collected for publication and it is pointed out in the letter of transmittal by Dr. A. W. G. Wilson, who was entrusted with the work of editing the manuscript for publication, that the Mines Department is indebted to Dr. McLennan for his courtesy in offering the manuscript to that Department for publication.

The story of helium is one of the most interesting of war-time development and accomplishment. In this report are collected the data obtained by the admirable work done on the subject by the authors, and it is pleasing to know that the investigators were drawn from the Canadian universities, although they worked under the aegis of the British Admiralty.

One-third of the bulletin is given to a review of the studies carried on regarding the helium content of the natural gases of Canada. It is shown that the helium content of the richest gases of Western Canada is about 0.36%. The progress made in the separation of helium from natural gas is indicated by the fact that in one particular set of experiments, helium of 87% purity was obtained. The several stations set up for experimental purposes are mentioned and some notes are made regarding the success achieved at each. The report states that helium can now be produced on a large scale at a cost of less than 25 cents a cubic foot, which was the first estimated price for the commercial product. Operations are being carried on in Western Canada and in the United States and England.

Those mentioned in the introductory note as being intimately associated with the work now reported are, in addition to Dr. McLennan, Professors Satterly and Burton, Capt. H. A. MacTaggart, Mr. R. T. Elworthy, Mr. V. F. Murray, Mr. E. Edwards, Mr. J. T. F. Young, Mr. H. J. C. Ireton, and K. H. Kingdon.

Munitions Resources Commission.

Final Report, 1920. 260 pp. Cloth. 59 plates. 4 figs. The Commission was appointed for the purpose of instituting an enquiry regarding the supply and sufficiency of raw materials in Canada required for the production of munitions of war, and the best methods of conserving the same.

The list of subjects investigated includes: Tool steel, scrap steel, Nicu steel, copper and nickel, aluminium, chromium, fluorite, magnesite and dolomite, manganese, molybdenum, platinum and tungsten. The present report brings together all the data collected on the subjects mentioned, or as much of it as it was thought advisable to gather into a volume for public distribution at this time.

News Items

BRITISH COLUMBIA.

Vancouver.—The Western Canada Pulp & Paper Co., Ltd., who have taken over the properties and good-will of the Rainy River Pulp & Paper Company, are making extensive enlargements to the plant located on Howe Sound. The capacity of the plant will be 40 tons per day of sulphate pulp.

ONTARIO

Chatham.—The city engineer will, by the authority of the City Council, call for tenders for the construction of an incinerator for disposing of the city's garbage.

Hamilton.—The Steel Company of Canada, at Hamilton, Ont., is planning the erection of an addition to their plant, to be used for the making of wire fence. Estimated cost, $250,000.

Merritton.—The directors of the Canadian Vegetable Parchment Co., Limited, are considering the addition of a second machine to their plant. The plant commenced operations March 15, 1920, and their product has been favorably received by the dairy and creamery trades, who use it for wrapping purposes.

Cobourg.—The Bird-Archer Co., of New York, who have been operating a plant here for the manufacture of boiler compounds, have acquired the ammunition plant formerly operated by the Cohoes Steel Company. They have transferred their boiler compound plant to the new plant and propose to add the manufacture of high-speed cast-iron tools, as well as other special compounds.

Fort William.—The Spanish River Pulp & Paper Company announces that its new three-million-dollar plant will be located at the Mission, Fort William, building operations to commence immediately. A subsidiary company will be organized by the Spanish River Company in connection with their new plant to be known as the Fort William Pulp & Paper Company, Limited.

Nipigon.—A new pulp and paper mill will be erected here by the Nipigon Fibre and Paper Mills, Limited. The new company is capitalized at $1,000,000. The plant will have a capacity of 40 tons of pulp per day, which will probably be increased to 100 tons by the end of the first year's operations. Construction will commence shortly on the site, one mile west of the village of Nipigon.

Ottawa.—The Beaver Board Companies are turning their laminating department, recently moved to Thorold, into a plant for the production of asphalt roofing. The industry will be known as the Roofing Division of the Beaver Board Companies, and manufacturing is expected to start this month, employing about forty men.

Ojibway.—Preliminary construction work on the plant of the Canadian Steel Corporation is being proceeded with, but the work is not being rushed as conditions are not judged opportune for "rushing" the job. The steel superstructure for the two large blast furnaces is being erected. These furnaces will have a capacity of from 550 to 600 tons of pig iron per day.

Oakville.—Glassco, Limited, fruit preservers, have completed an addition to their plant, increasing their output from 25 to 35 per cent.

St. Catharines.—The Kinleith Paper Mills, Ltd., are enlarging the capacity of their plant by 25 per cent. by adding extra dryers, etc., to their paper machines. An addition 70 feet long has been made to one of the machine rooms. Total cost of alterations and new equipment, $90,000.

Hamilton.—The new plant of the Norton Company of Canada, Ltd., is now in operation. This is a branch of the Norton Company of Worchester, Mass., and Chippewa, Ont., and will manufacture alundum grinding wheels made by both the vitrified and silicate processes.

Toronto.—The plant of Baldwin's Canadian Steel Corporation, situated at Ashbridge's Bay, will be ready for operation probably by the time this issue is in the reader's hands. It is the expectation of the directors that in the course of time this plant will he able to supply the entire Canadian market for steel sheets, black plate and tin plate. The company originally intended to install 40 mills at an outlay of $3,000,000, but owing to the shortage of power the plant had to be reduced to one unit of eight mills. The original idea will be resorted to when the Chippewa-Queenston Hydro-Electric Power Commission's canal is completed, and the company can receive their full requirement of 20,000 h.p. The whole of the equipment, with the exception of the driving wheels, was either manufactured right at the plant or by Canadian plants. Many skilled workmen will be brought out from Wales, England, and a total of 800 hands will be given employment in the new works. Mr. S. R Cound, the general manager, designed, constructed and operated the first tinplate plant in Russia, located at Moscow, where he resided for fourteen years.

The United Drug Co. have completed an addition to their plant at an estimated cost of $125,000.

Welland.—The Joseph Stokes Rubber Company, of Trenton, N.J., have acquired a three-acre site here and are erecting plant for the manufacture of hard rubber goods, plates and cells for batteries, etc. The first plant unit will be 65 x 160 feet, other units being added later. Operations are expected to commence in December next, employing over a hundred employees.

NOVA SCOTIA.

Sydney.—The Dominion Iron and Steel Company, now the British Empire Steel Corporation, has placed an order with the Koppers Company of Pittsburgh for a third battery of by-product coke ovens, sixty in number, similar to the other two batteries installed in October, 1919, and March, 1920, respectively. The first ovens built for the Dominion Company and installed in 1900 were of the Otto Higenstock type, and have been abandoned for some time, and are now being used for the construction of brick kilns in connection with the silici-brick plant which the Steel Corporation is now erecting. The company has just recently shipped 1,000 tons of steel ship plate to Australia and New Zealand.

SASKATCHEWAN.

Regina.—Large financial interests of Toronto are behind the proposed establishment in Southern Saskatchewan of a paper mill, making paper from the thousands of tons of waste paper in the province. Close proximity to the lignite fields of Saskatchewan where cheap fuel may be obtained is one of the chief reasons for locating here. From two tons of straw and two tons of coal, one ton of paper can be made. There are several such plants in the United States and one in Eastern Canada. The estimated cost of construction is $1,000,000. Ex-Mayor Phillips, of Trenton, Ontario, is making the arrangements regarding location and construction.

QUEBEC.

Grand Mere.—The two new huge paper machines being manufactured by the Dominion Engineering Works, Montreal, for the Laurentide company, will be installed and in operation before the end of the year. The 80 dryers needed for the two machines have been cast. Construction of the new machine room to accommodate the new machines has been completed and installation of the new machinery has commenced.

TRAFFIC THROUGH CANADIAN CANALS DURING AUGUST, 1920.

The Transportation Division of the Dominion Bureau of Statistics publishes the following on the traffic through the Canadian canals during August, 1920:

The total number of vessels passing through all Canadian canals was 4,892, with a net tonnage of 1,928,260, an increase of 45,200 tons over August, 1919.

Sault Ste. Marie Canal—The total number of vessels through both Canadian and American locks was 2,915; net tonnage, 8,446,022; cargoes, 12,425,372 tons; against 2,103 vessels, 5,138,200 net tonnage and 6,609,961 tons cargoes last year.

Through the Canadian Lock—vessels, 716; net tonnage, 715,583 tons; passengers, 16,275; cargoes, 405,679 tons.

There was a big increase in the down traffic through the Canadian and American locks over August, 1919.

Total down, August, 1920—9,279 tons; August, 1919—6,609,961 tons; increase, 2,669,325 tons. This was made up chiefly by increases of 4,056,827 tons of iron ore and 6,025,292 bushels of wheat.

For the season there has been 33,573,707 tons of iron ore against 29,407,053 tons down last year, an increase of 4,166,654 tons, and 39,099,711 bushels of wheat. against 56,106,225 bushels last year, a decrease of 17,006,514 bushels.

The ore shipments last year were affected by the strikes. The decrease in the wheat shipments is partially explained by an increase of 5,765,000 busnels by rail east from Fort William and Port Arthur to July 31 over last year.

There was an increase in the up traffic of 1,617,909 tons, principally in the soft coal. Soft coal up, August, 1920, 2,533,614 tons; soft coal up, August, 1919, 1,819,558 tons.

The total soft coal shipments for the season are 5,376,-364 tons, against 8,149,369 tons last year, a decrease of 2,773,005 tons.

The hard coal shipments for the season are 1,124,860 tons, against 1,148,176 tons last year, a decroase of 23,316 tons.

There is one lock on the Canadian side of the river and four on the American side, two of which are larger than the Canadian lock. The fourth lock was opened Septem-

ber, 1919. Hence there is a much greater traffic through the American locks.

Welland Canal—The total freight through the Welland Canal was 369,720 tons, against 336,337 in August, 1919. Compared with 1919 there were decreases in grain, oil and steel, but an increase of 126,770 tons in soft coal. For the season there has been a net decrease of 95,926 tons, made up chiefly by decrease of 4,695,500 bushels of grain, 59,711 tons of oils, and 14,373 tons of steel, and an increase of 120,555 tons of soft coal. There was an increase of 39,202 tons of soft coal in August over July going down.

St. Lawrence Canal—On the St. Lawrence Canal, compared with August, there was an increase of 87,721 tons of freight.

The totals are: Up—freight, 100,759 tons; down, 430704 tons. Compared with August, 1919, there was a decrease down of 11,090 tons of oils and an increase of 108,917 tons of soft coal. For the season there has been 543,500 tons of soft coal (mostly all down), against 579,840 tons last year.

REPORT OF THE BRITISH TRADE COMMISSIONER IN ONTARIO.

The following are extracts from the reports on the trade of Canada and of Ontario by F. W. Field, British Trade Commissioner in Ontario, just issued as a British Government Blue-book:

Prominent Part for Canada.—A review of the year which has elapsed since the signing of the Armistice, suggests that economic, industrial and commercial conditions are sound, and that given more stable political and social conditions throughout the world than those obtaining at the beginning of 1920, the Dominion should achieve a degree of development far surpassing that achieved hitherto.

Market for British Manufactures.—As as market for British manufactures, Canada presents an attractive field, more especially in the lines in which United Kingdom manufactures which constituted the business here of of Canadian manufacturing, of which such a large proportion is carried on in Ontario, leads one to the conclusion that the greater part of British trade in this market will in future years be confined to the principal groups of manufacturers which constituted the business here of United Kingdom firms before the war.

Japanese Activities.—The activities of the Japanese continued during the past year and every effort is being made to obtain business in the Canadian market. A large range of samples of goods sold here have been obtained by the representatives of Japanese manufacturers and agreements made to duplicate them at a much lower price than quoted by their competitors. A number of factors are operating against the acquisition by Japan of a large volume of trade in this area, including such matters as terms and methods of doing business, deliveries, quality, etc., but it would be a mistake on the part of United Kingdom manufacturers to ignore the growing strength of this competition.

Agencies in United States.—It is still a matter for the consideration of certain United Kingdom firms as to whether their agency arrangements for Ontario, and Canada generally, should be treated as part of their United States agency arrangements. At least one British firm with branch works in the United States has now established a branch in Ontario. The tendency of United States firms with trade connections in Canada is to establish separate units in Canada, either branch works, offices, or agents, to deal with their Canadian trade.

Machinery Sales and Service.—There appears to be an opportunity for increased sales of machinery of various kinds in Canada, including air compressors, hoisting machinery, mining equipment, textile machinery, and various other lines in which United Kingdom firms have proved specialists. Three of the factors operating against greater business are the lack of sufficient local representation and active salesmanship, the failure of United Kingdom manufacturers to keep in constant touch with those who have purchased their machines, and the inability to effect re- second-hand machinery previously used in munition shops. pairs and supply spare parts at short notice. While the business in any one line may not be large enough to justify the establishment of a proper local organization, which have joint representation in Canada, with a technical man to look after repairs; a good sales organization, which would adopt the American "follow up" system, as it is termed; and a stock of the spare parts which are most likely to be needed. Unless some such system is adopted, it is to be feared that the imports of United Kingdom machinery to this market will become continually smaller.

Advertising.—There is room for much more advertising by the majority of United Kingdom firms doing business should remove the difficulties noted, it might prove feasible for several manufacturers of non-competing machinery to dull market conditions in certain lines, and the sale of here. The local agent among others should be consulted as to the best methods of expending the advertising appropriation.

From War to Peace.—The transition of industrial works from a war to peace basis in Canada is being effected gradually and with varying results. Foundries and machine shops in some instances appear to have had difficulty in securing sufficient business to occupy their capacity since the Armistice. Many works were enlarged to cope with the demand for munitions, and the increased capacity has not always been utilized, partly on account of labor troubles, On the whole, however, few adverse effects were apparent during the year as a result of post-war conditions.

A note of the actual present position of a few typical industries in Ontario, which devoted their energies to war work, will be of interest:

(a) Firm of founders, crane makers and machinists: Sufficient business has not been obtained to occupy full capacity. The firm is now in a position to handle the lines previously made and one or two new ones, including machine tools.

(b) Firm making drop forgings and drop forged tools: The capacity of the works was doubled during the war. The company is operating to full capacity and is making several new lines.

(c) Firm making marine and heavy forgings: The works were enlarged hy about 500 per cent. during the war, the product being mostly forged steel shell cases. The shell plant has been scrapped and is standing idle. The production of marine forgings and locomotive parts is being continued, but owing to a decline in the demand for these lines, the works are operating under capacity.

(d) Firm making small machinery, etc.: The entire works were devoted to war work. Its plans for the future, after the armistice, were laid aside on account of the unrest in the ranks of the metal workers, causing a disorganization which in November, 1919, was still apparent.

(e) Firm making locomotives. This firm continued its regular lines during the war, making also shell forgings and finished shells. The forging and machining plant was sold, the buildings remodelled as blacksmith and tank shops for the company's regular work.

(f) Firm making motor cars. During the war the company's works were applied to the manufacture of aeroplane engines, 200 men being employed. The company is now making motor cars, its plans calling for the production of 15,000 cars during the twelve months ending October, 1920; 1,000 men are employed.

(g) Firm making shrapnel tuhes during the war. The company is now making bushings for motor cars and is doing a domestic and export business to the United States.

(h) Firm making shells during the war. The company is now making motors for phonographs and lighting fixtures.

(i) Firm making shells during the war. The company is now engaged in the manufacture of agricultural tractors, and is seeking export as well as domestic business.

(j) Firm making machinery and shells during the war. The company's works were purchased by an United States firm for the manufacture of tungsten products.

(k) Machine and stamping company. After the completion of munition contracts, this concern commenced the manufacture of several lines, one department being devoted exclusively to the making of gears and transmission cases for motor cars. In the near future, bevelled gears and differential cases for a similar purpose will be made. A heat treating plant to harden and heat gears has been established. The company is also making phonograph motors and gramophone cabinet hardware, such as hinges, lid supports, needle cups, etc. Other departments are making spark plugs for motor cars, and bicycle chains. In addition, the company is doing a commercial business in small stampings and automatic screw machine products. All these lines have been taken up and developed sinces the armistice.

CATALOGUES RECEIVED.

Analytical and Other Balances and Weights.—This is the title of Catalogue No. 1, recently issued by Canadian Laboratory Supplies, Limited, 615 Yonge St., Toronto, and is the most comprehensive catalogue of its kind ever issued in Canada. Practically everything in the line of balances for the general chemical laboratory is described and illustrated in this catalogue, as well as balances suitable for the Textile industry, for calculating the weight of cloth and wool, etc., per yard. The price of each balance is given. The first eleven pages are devoted to eleven different types of analytical balances. In the pages that follow, the following balances and articles are described: Balance for Ore, Sugar, Pulp, etc.; Balance for Technical Work; Chainomatic Balance for Specific Gravity (liquids); Troemner Specific Gravity Balance; Torsion Specific Gravity Balance; Harvard Scale Balance; Soil and Asphalt Testing Balance; Chemical and Drug Torsion Balance; Torsion Solution Balance; Grain Grading and Color and Dye Balances; Textile Balances; Moisture Test Balance; Cream Test Balance; Sets of Weights and Riders; Forceps. Each article is well illustrated and the catalogue, as a whole, is very complete.

Scientific Materials Co.—The Scientific Materials Co., Pittsburgh, Pa., have just issued two illustrated folders, describing their metallurgical equipment for the examination and photography of the micro-structure of metals and for the testing of the hardness of metals. The Scimatco Optical Bench (improved), is described, and the latest improved American model of the Brinell Hardness Testing Machine. The principles used by Brinell in the method which he originated in 1900, for making hardness tests of metals, are those employed, but the manner of carrying out the method has been changed.

Colonial Supply Co.—The new catalogue of the Colonial Supply Company, Pittsburgh, has just been completed and is now being distributed. It is handsomely bound in blue and gold, embossed leather, adhering closely to old Colonial style. The catalogue contains one thousand pages, profusely illustrated. The supplies covered range through every variety of machinery and equipment for Mines, Mills, Railroads, Construction Engineers, Contractors and Oil and Gas Producers. The task of compiling and publishing this valuable aid for the supply purchaser is reflected in the systematic arrangement and convenient index which make it easy for reference. The descriptions of all items contained are lucid and explanatory, while the illustrations are direct reproductions. The catalogue will be of great assistance to buyers.

HUGHES OWENS COMPANY ENTERS LABORATORY SUPPLY BUSINESS.

It will be a matter of interest to our readers to learn that Mr. J. O. Jarrell, who for the past ten years has been associated with the Topley Company, Ottawa, has been appointed general manager of the Hughes Owens Company, in Montreal, and that Mr. Peter Lennox, who for a number of years has been assistant in the chemical laboratories of McGill University, has been added to the sales force.

In addition to the lines which the Hughes Owens Company are now handling, i.e., optical instruments, they are adding a complete stock of engineering draughting instruments and supplies, blue and black print papers, and such

Mr. J. O. Jarrell.

other apparatus and supplies as are required by the industrial, educational and government laboratories. It is for this purpose that Mr. Jarrell has been secured, and he is specially fitted for this position, because, during the ten years he has been in Canada, he has served with satisfaction the interests of the laboratory user throughout the Dominion. Previous to coming to Canada, he was for seven years on the selling organization of the Bausch & Lomb Optical Company, and has had much first hand experience in handling and selling optical instruments of all kinds.

Mr. Lennox came to Canada from St. Andrew's University, Scotland. His experience in this institution, together with thirteen years' service at McGill, gives him a wide experience with the equipment required by the modern laboratory.

It is the intention of the Hughes Owens Company to carry in stock such apparatus and supplies as are readily demanded, which will be added to as circumstances justify. At the present time, we understand, they have one of the most complete stocks in Canada of microscopes and other high grade optical instruments. Messrs. Jarrell and Lennox will be very glad to hear from their friends and any others who may be interested in their lines. Their plans include the distribution of literature descriptive of laboratory equipment.

THE CHEMICAL INDUSTRY IN ITALY.

(Special Correspondence to Canadian Chemical Journal.)

July, 1920, was a very difficult month for the Italian chemical industry, owing to a further reduction in the value of shares, political difficulties, a rapid descent in the price of all chemicals and products causing many failures, and owing to Italian funds having suddenly lost a portion of their value through a recent rise in the foreign exchange.

The Extent of the Reduction in Prices.—The wave of reduction that followed abroad had also its effects in Italy, especially owing to the necessity of this country importing many of the products it uses. The extent of the reduction in the prices of the different classes of products can be gathered from the following figures, that represent prices quoted on the Milan market at the beginning and end of July:

Heavy Chemicals.—Alum, from lire 220 to lire 215; borax, from lire 600 to lire 540; carbonate of soda, from lire 175 to lire 150; chloride of ammonia, from lire 800 to lire 620; cream of tartar in crystals, from lire 2,500 to lire 2,100; caustic soda, 76-78, from lire 295 to lire 270; sulphate of soda crystals, from lire 65 to lire 40; sulphate of magnesia, from lire 140 to lire 90, etc.

New Companies in the Italian Chemical Industry.—Despite the above adverse conditions prevailing during July that continued to favor speculation and stopped a regular resumption of work in the different branches of the Italian chemical industry, or in the industries depending on the same, many capitalists did not hesitate in creating new companies, being encouraged in doing this through the enormous profits made during the last financial year, and which were superior to those ever paid before in this industry in Italy. Some of the new firms recently established are as follows:

The firm "Galeno" Sociata Italiana per l'Industria e il Commercio dei Medicinali was established with a capital of 10,000 lire for the manufacture and commerce of pharmaceutical products at Palermo in Sicily. In the same city was established the firm of Gaetano Torrente e C. with a capital of 20,000 lire, for 15 years, for the commerce of pharmaceutical and chemical products.

At Piacenza was founded the firm of Sinigaglia e Bagliani with a capital of 100,000 lire for 12 years. The scope of this company is the manufacture and sale of medicinals, mineral waters, chemicals, etc., and its headquarters have been fixed in Via G. Caeducii 11. In Milan was established the firm Societa Anonima Italiana di Profumerie ed Affini Adonia with a capital of 1,000,000 lire, in 1,000 shares of 1,000 lire, for the manufacture and sale of perfumes of all sorts. Under the name of Ugo Tonolli e C was founded at Milan a firm with a capital of lire 54,000 for the manufacture of waxes and allied products.

At Saronna was established a very large soap works with a capital of 1,000,000 lire, bearing the name of Ditta Filippo Reina, for ten years.

Profits Made in the Italian Chemical Industry: The petroleum extraction company of Piacenza, known as Sociata Petrolifera Italiana, made during its last financial year 73,891 lire of net profit on a capital account of about 2,000,000 lire.

The soap works, known as Saponerie Fratelli De Bernardi, in Genova, from a capital of lire 2,000,000, made a net profit of lire 449,021.

Increases of Capital: The glass works, known as Sociata Vetraria dell'Italia Centrale, with its headquarters in Rome, and a capital of lire 900,000, decided to bring this capital to lire 1,500,000.

The tannic acid works, "Societa Ligure Acido Tannico," of Genova, with a capital of lire 1,500,000 entirely invested, through the satisfactory dividends made, has decided to increase this capital to 3,000,000 lire by emitting 25,000 new shares reserved in option to the present shareholders.

The company possessing the lignite mines, Miniere Italiane di Lignite of Milan, approved the increase of the social capital from lire 300,000 to lire 1,500,000 through the emission of 12,000 shares of 100 lire.

The above gives a very fair idea of the financial power assumed in many of the concerns in the Italian chemical industry, and the possibility of further future extensions that will require new machinery, raw materials, etc, etc.

The greater portion of the above financial success was due to the great increase in the foreign exchange, that raised rapidly the prices of imported goods and allowed a successful competition on the part of national products despite the great difficulty of obtaining coal and raw materials.

CANADIAN PULP SHIPPED TO SPAIN.

Mr. Augusta Ramoneda, representing the paper mills of Spain, is in Canada endeavoring to secure 60,000 tons of pulp for the paper mills of his country. Seven thousand tons of the amount required left Quebec for Spain during the last week in June.

MINING IN BRITISH COLUMBIA.

(Special Correspondence to Canadian Chemical Journal.)

With its ore shipment on September 10, the Dolly Varden Mines, Ltd., brought its total silver shipment over the one million ounce mark, 575,000 of which has been shipped since the 17th of June of this year, when the railway was re-started. As heavy snow does not come in that district usually before December, it is expected that more than a million ounces will be shipped this year. The mine is shipping between 230 and 240 tons of ore runnng 37 ounces per ton daily to the smelter at Anyox, and about 20 tons per month that runs well over 1,000 ounces per ton, to the smelter at Tacoma.

Concentration Plant at Premier Progressing.

The Premier mine has started its winter shipments in a small way. Last year the Premier shipped only 1,500 tons of ore, running about 275 ounces to the ton, but this winter it is expected that at least double this amount will be shipped. The concentration plant is progressing slowly, owing to the difficulty of hauling in supplies, but it is hoped that the first 100-ton unit of the plant will be finished early in the new year.

Considerable disappointment has been caused by cessation of work at the Big Missouri, higher up the Salmon River than the Premier. Many engineers hoped that this would be developed into a shipping mine. The bondholders, however, appear not to have found sufficient high-grade ore by diamond drilling to warrant them in taking up the option, and the immense low-grade deposit that has been demonstrated on the surface offers too many metallurgical difficulties to be attractive in such a difficult accessible situation.

Payne Mine Re-started.

Considerable interest is being taken in the re-starting of the old Payne mine, in the Slocan district. The mine comprises six crown granted leases, one of which was the first claim to be located in the district. Since its discovery, in 1891, the mine has produced ore worth more than

$5,000,000, and at a time when neither silver nor lead was worth anything like as much as it is to-day. The main ore shoot, which has been stoped out from the No. 5 level to the surface, was 1,200 feet long, about six inches wide, and averaged 68 per cent. of lead and 120 ounces of silver per ton. Some 50,000 tons of such ore was shipped, and also 6,000 tons of zinc ore. The property was purchased later in the nineties by a company promoted by Clarence McQuaig, of Montreal. The new company erected a dressing plant at the railroad, connected it with the No. 5 level, and milled 180,000 tons of lower-grade ore that the previous owners had left in the stopes. In 1920 the mill was destroyed by fire, and soon after the Montreal company closed the mine. In 1912, W. E. Zwicky, who was superintendent for the Montreal company, organized a company to take over the mine on lease and bond. A 4,000 foot tunnel was driven to tap the vein at a depth of 725 feet below the No. 5 level. Either some miscalculation was made in setting out the direction for the tunnel. or the vein had faulted, for it was found after a considerable amount of cross-cutting 200 feet to the left of the trend of the tunnel. At the point of intersection it did not carry the rich streak, characteristic of it in the upper workings. The company's funds had become exhausted, war had broken out, and this together with the absence of the rich streak prevented the raising of more capital. The Pacific Mine Development Co. has been organized by Campbell, Wells & Elmendorf, of Seattle, to take over and operate the mine under bond and lease. The agreement calls for an expenditure of not less than $5,000 in any year, and the payment of 15 per cent. on all ore sold, such payments to go towards the purchase price of the mine. The new company will start exploration work in the present bottom level.

The Granby Consolidated M. S. & P. Co. has rapidly found a way of avoiding the new freight rates. The company has made arrangements with the Canadian Dollar Steamship Co. to transport its blister copper from Anyox to the refinery at Long Island, New York, by way of the Panama Canal. Officials of the company state that by this move a 50 per cent. cut has been made on the new freight rates, and the metal will be 15 days less in transit, the time being reduced from 60 to 45 days. Practically all the mines situated near the coast will ship either to Anyox or Tacoma in future, to avoid the freight rate to Trail.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

As stated in our September issue, following the usual quiet summer period, business in chemicals, both heavy and fine, commenced to revive about September 1st. There is no doubt but that this revival of business, while good in some lines, was not, especially in the heavy chemicals, as active as many would have wished. Consequently trading throughout September, both in Canada and the United States, was light compared with September of last year. The cause of the prevailing quietness is the attitude that many buyers are taking in expecting prices to drop. Contracts for next year's business are being offered in a few cases, but are not creating much interest on account of the uncertainty of costs and prices. Second-hand material is still "butting in," particularly on the American market, but producers are not greatly disturbed by this factor, and face the future with considerable confidence. Manufacturers of heavy chemicals, particularly caustic soda and bleaching powder, cannot see from their end of the game where lower prices can be expected, and this would seem to be a sane view to take of the situation, for it is certain production costs in these plants have not come down, but, indeed, on the other hand, the recent increases in freight rates have shut off any immediate chance of reductions. One better feature of the situation as regards the caustic soda plants is that a continuous supply of coal seems assured. Perhaps buyers do not appreciate just how serious this coal supply matter was a month past.

There may be some justification for expecting lower prices on fine chemicals, pharmaceuticals, etc. Buying has not been as heavy as usual for this time of the year, and manufacturers are not therefore pushing production, as present stocks are taking care of immediate requirements. However, this is a market which is very hard to gauge as to future action, even immediate. Before the end of this month many dealers expect to see a good revival in pharmaceuticals, and even at this writing the usual jobbing orders are more than holding their own, even if large scale orders are conspicuous by their absence.

Oils.

A gradual decline in the present high prices of oils, crude and refined, seems to be in sight. While the demand is fair for all products, yet it is not enough to hold prices steadily at previous figures. Strong efforts are being put forth by American refiners to increase the tonnage of oil from the Mexican fields, as it is known that the Mexican supply could well take care of the needs of consumers. In the meantime Mid-Continent fields are looked on to supply the bulk of North America's requirements.

Steel.

Uncertainty as to general business, and also as to future prices of steel is responsible, it would seem, for the present dullness in the steel market. This dullness is noted particularly of future business, that is orders for future business are not coming in as they should, but works are still kept busy supplying contractors who are behind in construction promised some months ago when business was brisk.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Acid phosphoric, specific gravity 1.750	Lb.	.. — .52
Alum, Ammonia, lump and ground	100 Lbs.	.. — 7.00
Ammonium Bromide	Lb.	.. — .92
Aluminium Sulphate, high grade, bags	100 Lbs.	5.75— 6.00
Ammonia, Aqua 26	Lb.	.10½— .12
Ammonium Carbonate	Lb.	.18— .19
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—50.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	4.50— 5.50
Borax, crystals	Lb.	.. —.11½
Boric Acid, powdered	Lb.	.. —.19½
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	45.00—50.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.14— .16

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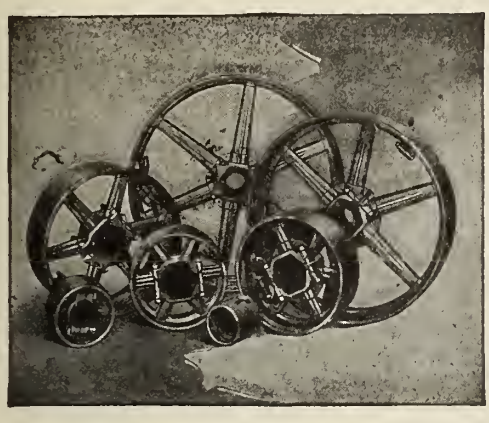

to be easily reached by the long arm of Colonial Service. The reason for the appearance of our advertising in these pages is to receive inquiries from all readers of the Canadian Chemical Journal.

This month we have some valuable information to impart concerning Power Transmission Appliances suited to the peculiar needs of Chemical plants. If you are interested, your inquiry by mail will bring a prompt reply.

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Chrome Black.
Gums—Arabic, Karaya, Tragacanth, Yacca.

Canadian Representative: T. E. O'REILLY LIMITED, 608 Excelsior Life Building, Toronto, Canada

Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, drum	Lb.	.07½—.08½
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.09¾—.10¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 2.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.17— .19
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.14— .18
Magnesium Sulphate	Lb.	.05½— .06¼
Mag. Sulphate, B.P., Medicinal	Single Ton	95.00—110.00
Mag. Sulphate, B.P., Tanners, car lots	Ton	85.00—90.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .98
Potassium, Bromide, granular	Lb.	.. — .92
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — ..
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash).Sticks		.. — 1.35
Potassium Iodide	Lb.	.. — 4.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate	Lb.	.14— .16
Sodium Benzoate	Lb.	.. — 1.25
Sodium Bicarbonate, 100% pure	100 Lb.	4.00— 4.50
Sodium, Bichromate, bbls.	Lb.	.40— .45
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.. —.04¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.25— 2.50
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	3.00— 3.25
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Lb.	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.08¼— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic acid, commercial, crude, 28% in bbls.	Lb.	.06¼— .07
Acetic acid, refined	Lb.	.. — .21
Acetone	Lb.	.18½—.23½
Aspirin, in 100-lb. lots	Lb.	1.35— 1.40
Alcohol, pure, bbl., 65% O.P.	Gal.	11.00—16.00
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, refined, bbl.	Gal.	.. — 3.40
Amyl acetate, technical	Gal.	5.00— 5.50
Amyl acetate, pure	Gal.	6.00— 6.50
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 9.50
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .80
Formaldehyde	Lb.	.75— .85
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		3.50— 4.50
Oxalic Acid	Lb.	.. — .65
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	.. — 3.00
Quinine	Oz.	.90— 1.00
Resorcin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.90— .95
Stearic Acid, Double Pressed	Lb.	.. — .40
Stearic Acid Triple Pressed	Lb.	.. — .45
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.90— .95

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .33
Antimony	Lb.	.. —.09⅞
Brass, yellow ingots	Lb.	.. — .20
Brass, red	Lb.	.. — .23
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.23½
Copper, electrolytic	Lb.	.. — .24
Copper, electrolytic, in car lots	100 Lb.	.. —.23¾
Gold, Pure	Oz.	.. —45.00
Iron, common	Base Price 100 Lb.	.. — 5.00
Lead	Lb.	.. —.11¾
Lead, in car lots	Lb.	.. —.10½
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.35— .40
Platinum, pure	Oz.	.. —105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild	100 Lb.	.. — 4.50
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.56— .58
Zinc, sheets	Lb.	.. —.18½

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .40
Motor Gasoline (service stations)	Gal.	.. — .43
Lighting Gasoline	Gal.	.. — .45
Naphtha	Gal.	.. — .39
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .18
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots.. (Imp.)	Gal.	.. — 3.25
Rosin, Grade G. in 280 bbl. lots		.. —20.00
Rosin, Grade W.W., in 280 bbl. lots		.. —22.00

Gums and Vegetable Oils.

Vegetable Oils—		
Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .28
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots (Imp.)	Gal.	.. — 2.52
Linseed Oil, boiled, in bbl. lots (Imp.)	Gal.	.. — 2.53
Monopole Oil	Lb.	.. — .30
Gums—		
Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
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Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

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Animal Tankage, per unit of Bone Phosphate of lime		.. — .10

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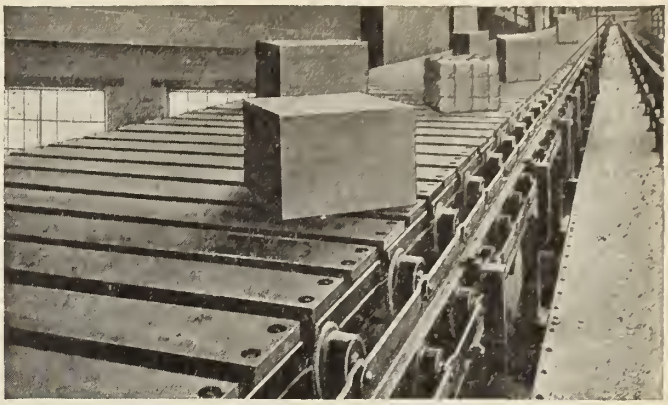

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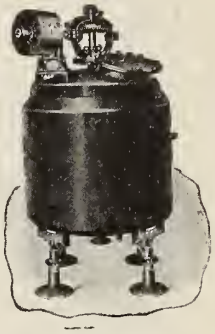

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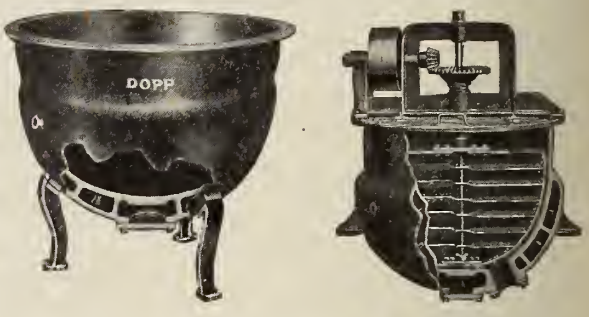

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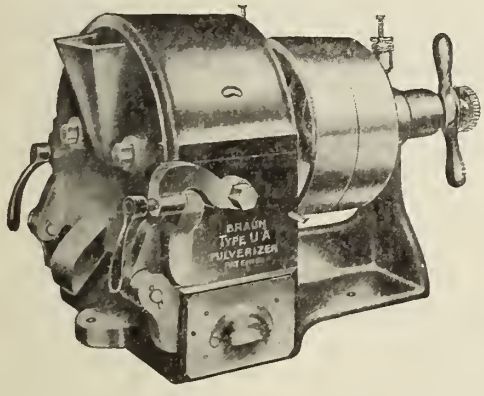

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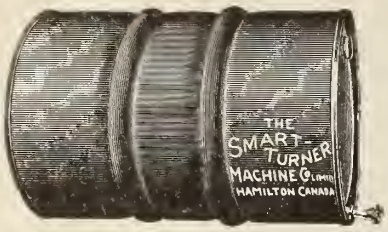

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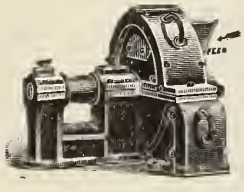

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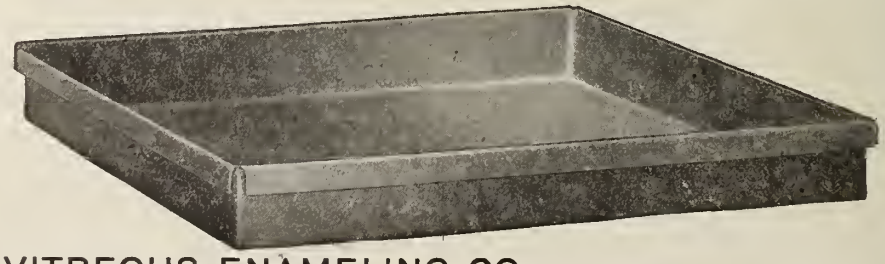

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We carry an assortment of Metallurgical Microscopes, Microphotographic Cameras and Accessories. Write for special bulletin.

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A New Atmospheric Rotary Dryer

"BUFLOVAK"

Rotary Dryer

Engel Type—Patented

This atmospheric dryer is adapted for drying a variety of materials that do not require a vacuum. The method of heating depends on the nature of the material being dried. For drying sugar and other materials at low temperature air is conveyed through a steam coil heater by means of a blower and passes through the drying drum carrying the moisture with it.

For materials that permit higher temperatures the air is first heated by passing through flues heated by indirect furnace heat, which is also used for heating the exterior of the drum—THE FURNACE GASES DO NOT ENTER THE DRYING DRUM.

A special feature of the drying drum is our patented disseminating screen. By means of the lifting shelves attached to the inside surface of the dryer shell, the material is lifted as the drum revolves and is disseminated by falling on the cylindrical screen, thus allowing for the free action of the drying air on the material.

The screen also breaks the fall of the sugar crystals or other materials being dried, thereby preventing to a great extent the breaking up of the crystals into small particles and the consequent formation of dust.

The material is fed into the dryer from a hopper through a chute. The hopper is equipped with a spiral conveyor, the speed of which governs the rate of feeding into the dryer. The alternate lifting and falling of the material combined with the inclination of the drum causes the material to pass from the inlet to the outlet, thus providing continuous operation with low cost for labor, power and maintenance.

"BUFLOVAK" AND "BUFLOKAST" PRODUCTS

"Buflovak" Vacuum Dryers—
Drum, Shelf and Rotary Types.

"Buflovak" Evaporators—
For all materials and capacities.

"Buflovak" Sugar Apparatus—

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For producing heavy chemicals, acids, caustic soda and other alkalies, organic chemicals, high explosives, coal-tar, intermediates, etc.

Individual apparatus or complete plants.

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(Denatured Alcohol)

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DURING the last session of parliament, the Inland Revenue Act was amended so that the sale of Methylated Spirits (denatured alcohol) is no longer controlled and carried on by the Department of Inland Revenue.

Our Distillery at Corbyville, Ontario,—the largest Industrial Alcohol plant in the British Empire—is fully equipped and thoroughly organized to serve manufacturers who use Methylated Spirits or Denatured Alcohol.

We will be pleased to place at your disposal the advice of our chemists in regard to the use of specially denatured alcohol. One of these formulas may prove more suitable in your business than that which you are now using.

We also manufacture Ethyl Alcohol, Cologne Spirits, Fusel Oil and Non-Potable Alcohol.

All orders received by us will be given the prompt and careful attention that only an organization such as ours can give.

CANADIAN INDUSTRIAL ALCOHOL COMPANY, LIMITED

HEAD OFFICE - MONTREAL CANADA

ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF LANDS FORESTS & MINES
BUREAU OF MINES

Hon. H. Mills, Minister of Mines

In the following table, subject to revision, is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Revised figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Ontario, in 1919, produced 38 per cent. of the total mineral output of Canada.

Summary of Mineral Statistics, 1919.

Product.	Quantity.		Value.	
Metallic:	1918.	1919.	1918.	1919.
Gold . . . . . ounces	411,878	505,963	$8,502,480	$10,451,688
Silver. . . . . "	17,738,153	11,383,905	17,415,882	12,913,316
Platinum metals . . . . . "	.....	1,770	.....	200,000
Copper. . . . . lbs.	1,211,922	5,676,394	270,430	967,933
Copper in matte (a) . . . . . tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)..... "	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)..... "	107,273	5,828	624,364	47,591
Iron, pig (c)..... "	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic . . . . . lbs.	404,348	121,926	887,960	243,554
Cobalt oxide . . . . . "	477,583	426,573	727,170	624,553
Nickel oxide . . . . . "	406	11,817	106	3,762
Nickel, metallic . . . . . "	3,450,550	11,355,390	1,262,116	3,931,655
Other Nickel compounds . . . . "	453,515	353,267	73,347	46,711
Other Cobalt compounds..... "		66,193		48,230
Lead, pig . . . . . "	1,670,251	1,459,149	149,841	90,490
Molybdenite, concentrates . . . "	47,614	.....	59,067	.....
Metallic total	.....	.....	66,178,059	41,510,742
Non-Metallic:				
Actinolite . . . . . tons	228	160	2,508	1,176
Arsenic, crude and white.....lbs.	5,090,818	5,668,170	566,332	485,360
Barite. . . . . tons	60	.....	900	.....
Clay products—				
Brick, fancy and pressed.....M	25,377	34,934	396,698	631,233
Brick, common . . . . . M	49,498	100,095	665,454	1,477,836
Pottery.	.....	.....	88,275	114,551
Sewer pipe	.....	.....	362,536	405,413
Tile, drain . . . . . M	13,087	11,208	309,899	297,778
Tile, hollow building.....	.....	.....	195,598	166,451
Cement, Portland . . . . . bbls.	1,226,244	2,022,575	1,910,839	3,659,720
Corundum. . . . . tons	137	.....	26,120	.....
Feldspar . . . . . "	19,784	14,319	111,173	86,493
Fluorspar . . . . . "	7,286	3,425	153,190	60,039
Graphite, crude and refined . . . . "	2,934	1,340	208,848	99,821
Gypsum, crushed, ground and calcined. . . . . "	38,214	59,899	151,564	278,111
Iron pyrites . . . . . "	270,966	109,080	1,144,737	267,211
Lime . . . . . bush.	2,650,285	3,835,721	872,177	1,235,736
Mica. . . . . tons	275	556	49,575	53,247
Mineral Water . . . . . Imp. gals.	298,498	99,733	133,808	7,563
Natural Gas . . . . . M. cu. ft	13,075,742	10,114,948	2,498,769	2,383,394
Peat. . . . . tons	.....	500	.....	1,750
Petroleum, crude . . . . . Imp. gals.	10,106,615	7,703,515	781,097	632,789
Quartz. . . . . tons.	213,420	67,973	452,711	212,329
Salt. . . . . "	131,726	148,112	1,287,039	1,395,338
Sand and Gravel.....cu. yds.	1,023,497	.....	553,638	500,000
Sand-lime Brick . . . . . M.	7,941	15,538	91,508	209,646
Stone, building, trap, granite, etc...	.....	.....	869,239	1,068,957
Talc, crude and ground.....tons	17,465	17,571	246,691	240,399
Total non-metallic.....	.....	.....	14,130,913	15,971,371
Add metallic	.....	.....	66,178,059	41,510,742
Grand Total	.....	.....	$80,308,972	$57,482,113

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918. and 623,586 tons worth $16,010,537 in 1919.

Dividends and Bonuses paid to the end of 1919 amounted to $15,545,238 for gold mining companies, and $78,335,943 for silver mining companies, or a total of $93,881,181.

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For illustrated reports, geological maps and mining laws, apply to

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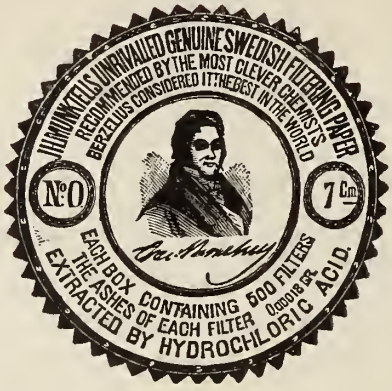
DEPUTY MINISTER OF MINES,
TORONTO, ONT.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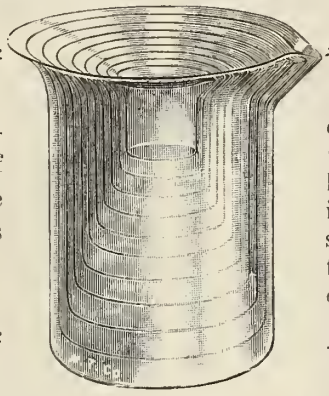
NONSOL GLASSWARE OVERSTOCK SALE

We are heavily overstocked on some lines of Nonsol Glassware, so have decided to reduce prices by at least **one-third.**



Nonsol Glass has been on the market for many years and while not so heavy as Pyrex, combines in the highest degree resistance to heat and ability to withstand the action of chemical reagents.

	Regular Price.	Sale Price.
Beakers, Griffin's low form with lip—		
250 cc.	$2.80 dozen	$1.85 dozen
350 cc.	3.35 dozen	2.25 dozen
600 cc.	4.65 dozen	3.00 dozen
700 cc.	5.00 dozen	3.25 dozen
1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form with lip—	Regular Price.	Sale Price.
60 cc.	$2.00 dozen	$1.40 dozen
120 cc.	2.35 dozen	1.55 dozen
180 cc.	2.50 dozen	1.65 dozen
1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form without lip—	Regular Price.	Sale Price.
180 cc.	$2.50 dozen	$1.65 dozen
700 cc.	5.00 dozen	3.25 dozen
Flasks, Erlenmeyer (Conical) narrow mouth—		
	Regular Price.	Sale Price.
500 cc.	$3.25 dozen	$2.25 dozen
700 cc.	4.20 dozen	2.75 dozen
1000 cc.	5.00 dozen	3.25 dozen
2000 cc.	10.00 dozen	6.50 dozen
Flasks, Flat bottom, vial mouth, globular—	Regular Price.	Sale Price.
180 cc.	$2.35 dozen	$1.55 dozen
1000 cc.	4.65 dozen	3.00 dozen
2000 cc.	10.00 dozen	7.50 dozen
4000 cc.	16.60 dozen	10.50 dozen
Flasks, Flat bottom, heavy ring neck, globular—		
	Regular Price.	Sale Price.
250 cc.	$3.35 dozen	$2.25 dozen
500 cc.	3.80 dozen	2.50 dozen
700 cc.	4.25 dozen	2.75 dozen
Flasks, round bottom, vial mouth, globular—	Regular Price.	Sale Price.
1000 cc.	$4.65 dozen	$3.00 dozen
Flasks, Kjeldahl, long neck—	Regular Price.	Sale Price.
800 cc.	$6.00 dozen	$4.00 dozen

All orders will be accepted subject to prior sale.

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Our organization has a valuable service to offer to you, if you are interested in purchasing Chemical Apparatus.

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We also can construct and install complete plants for the manufacture of the following chemical products:—

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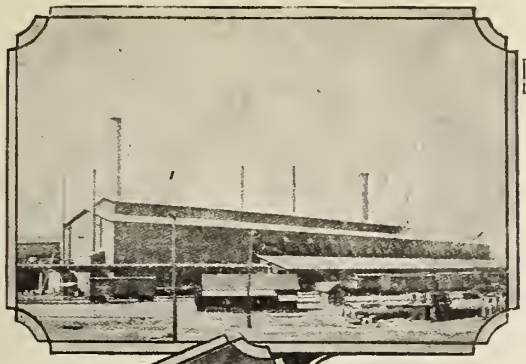
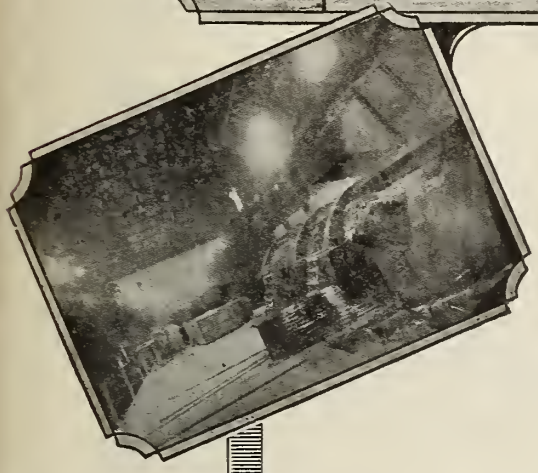


INCo

Copper Cliff Smelter



COPPER CLIFF is the outgrowth of the first smelter erected in the Sudbury District. It was started in 1886 with one 1-ton furnace and has grown until now it consists of eight blast furnaces, one reverberatory furnace and six large basic converters having an output of six thousand tons per month.

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INCO Nickel is sold as shot, high and low carbon; ingots, 2[illegible] and 50 lb. sizes; and electrolytic nickel, 99.80%. Prime metals for the manufacture of Nickel steel, Nickel silver, Anodes, and all remelting purposes.

It is also produced as rods, castings, sheets, strip stock, and wire.

INCO MONEL METAL

The name Monel Metal is given to a line of metal products produced by the International Nickel Company from a natural nickel alloy—67% nickel, 28% copper, and 5% other metals. These products include Monel rods, Monel castings, Monel blocks, Monel wire, Monel strip stock, Monel sheets, etc.

Monel Metal withstands alkalies, high temperatures and erosive action of gases and superheated steam and most acids. Can be forged, cast, rolled, drawn, machined, brazed, soldered and welded. Takes and retains a perfect nickel finish.

Monel Metal may solve your difficulties—our Technical and Sales Departments will gladly cooperate with you.

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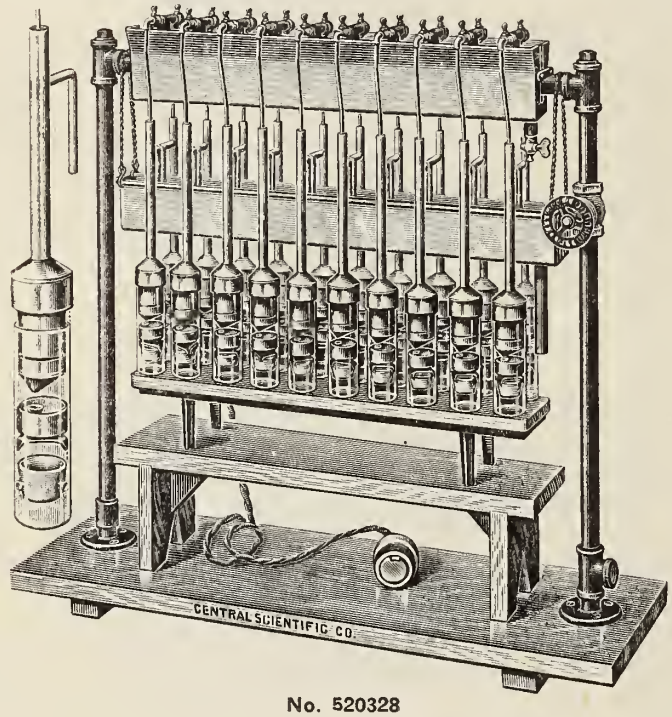
The New Pickel

Electric Extraction Apparatus

Cenco Built

FIRST SHOWN AT THE SIXTH NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES



No. 520328

The Pickel Extraction Apparatus was originally designed and built by Dr. J. M. Pickel of the Feed Laboratory of the North Carolina Department of Agriculture for his own use. Because of its unusual features it attracted much attention at the recent Chemical Show, where it was first placed on exhibit at our Booths. We have carefully preserved the author's design and have incorporated it into an instrument of careful workmanship and neat appearance, one which every chemical laboratory may take pride in possessing.

SPECIAL FEATURES:

1. Compactness Twenty extractions are run at one time on a 4½ x 24-inch hot plate.

2. Economy of Material Only 15 cc. of ether are required for each extraction, from ⅓ to ½ of which is recovered.

3. Economy of Time By a turn of the condenser the ether no longer drips through the funnel on the sample but is caught in the recovery cup, so that when the cylinder is dry the ether, residue and extract are entirely separate, and the two latter are ready to weigh.

4. Permanence and Stability Iron piping is provided for the cooling water, which is to be permanently connected to the water line. The water is distributed from the iron pipe through brass cocks and tubes directly to the metal condensers, from which it passes to the drain trough, the outlet of which may be connected by rubber tubing to the sink. The water pipes, which are firmly fastened by means of pipe flanges to a heavy wooden base, serve as the support for the catch basin and the drain trough. A valve in the inlet pipe permits control of the water pressure, while the cocks at the top enable close adjustment of the cooling streams to be made. The three-heat hot-plate serves as a support for the glass cylinders and condensers, and is in turn supported by a neat wooden table.

No. 520328—Complete as illustrated, with three-heat hot-plate with connecting cord and plug, support, twenty sets of glass cylinders with Alundum extraction crucibles, ether recovery cups and condensers, iron piping and supports as shown.

No.	A.	B.
For volts	110	220
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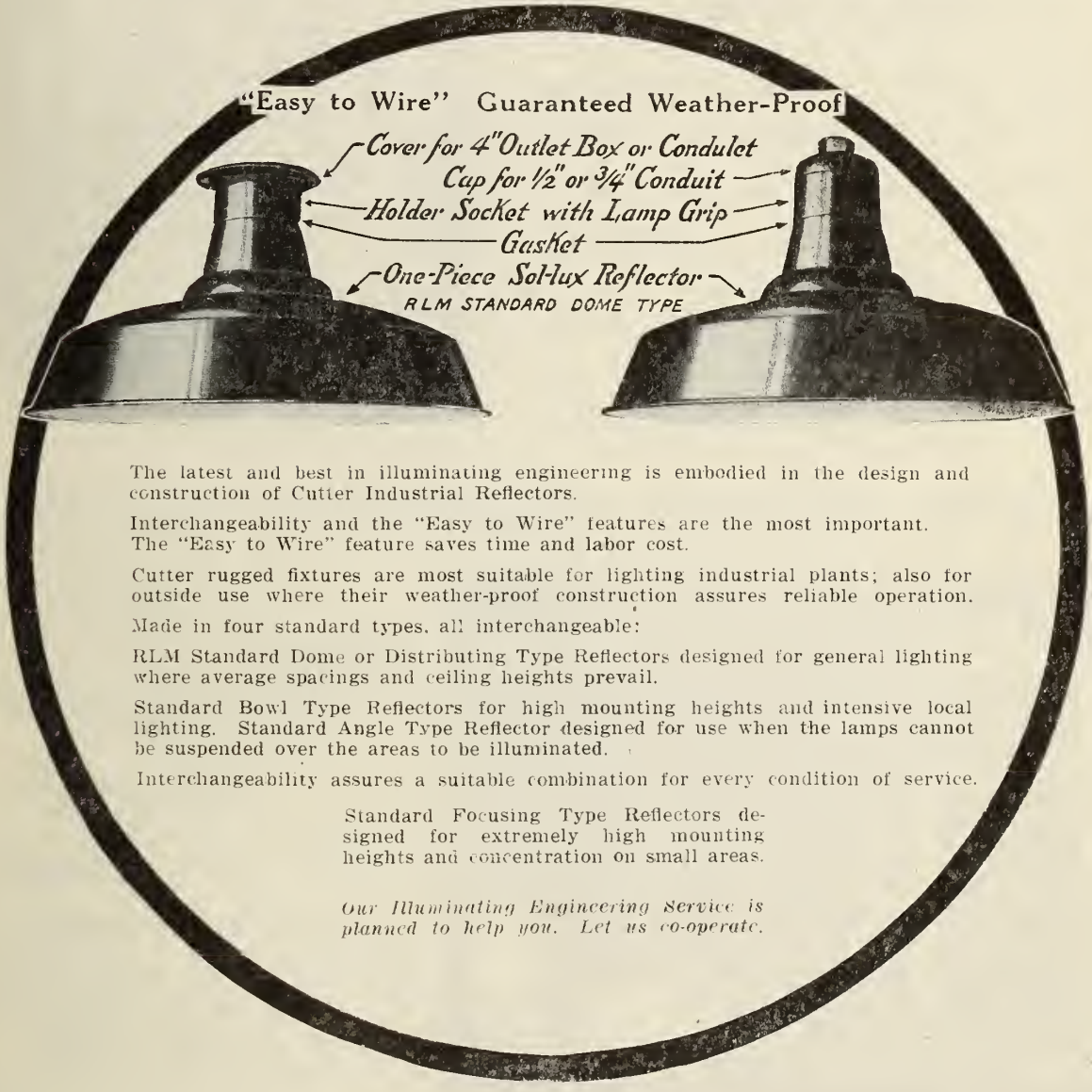
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RLM STANDARD DOME TYPE

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Interchangeability and the "Easy to Wire" features are the most important. The "Easy to Wire" feature saves time and labor cost.

Cutter rugged fixtures are most suitable for lighting industrial plants; also for outside use where their weather-proof construction assures reliable operation.

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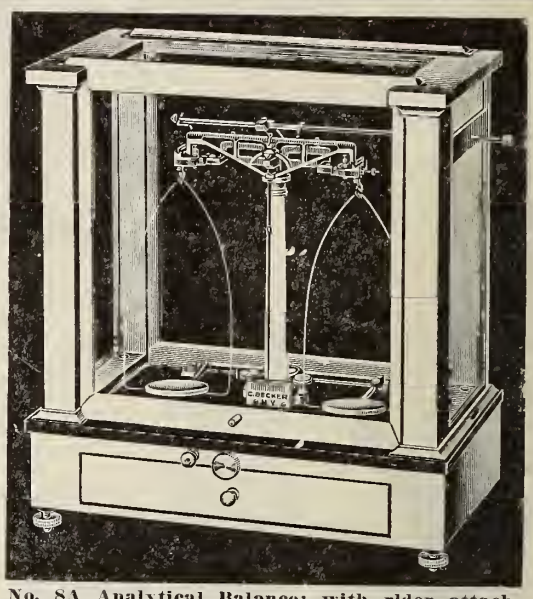

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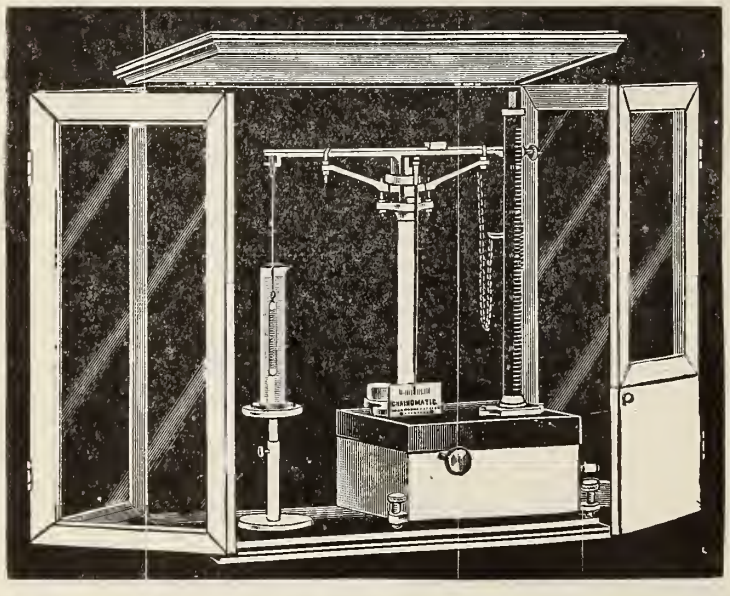

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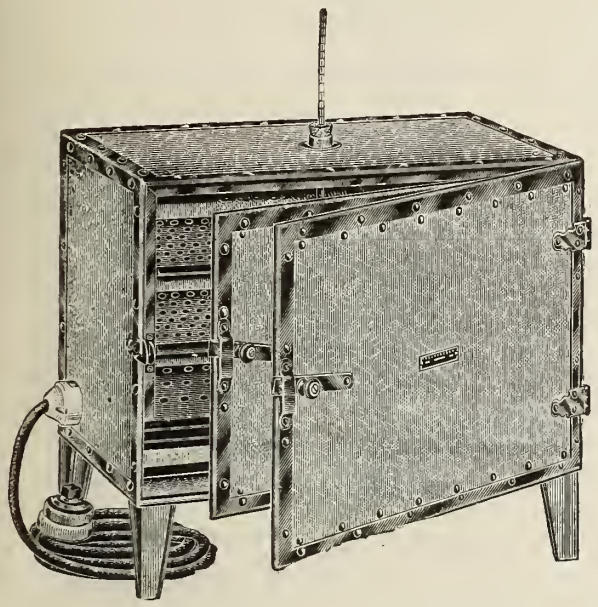

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Inside dimensions: height, 10 inches; width, 18 inches; depth, 10 inches; double wall construction, outer wall of insulating material, inner wall of Russia Iron. Two removable shelves. Temperature range 60° to 200° C. Heated electrically and automatically controlled by an Electro-Thermostat.

Maximum current consumption, 12 amperes.

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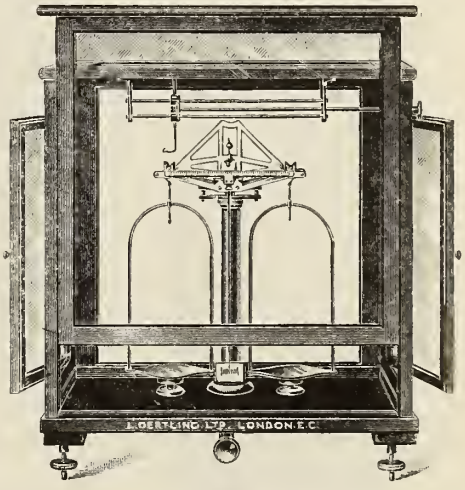

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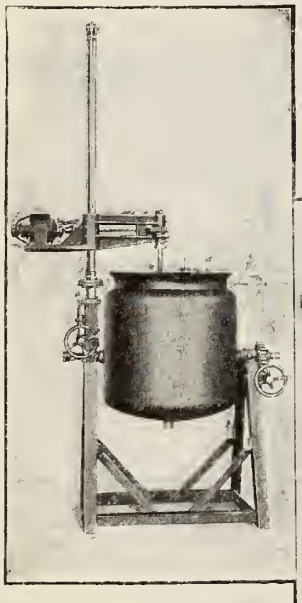

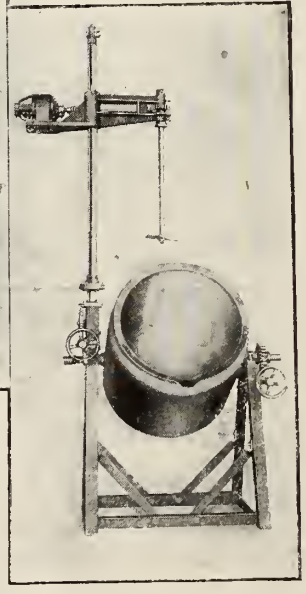

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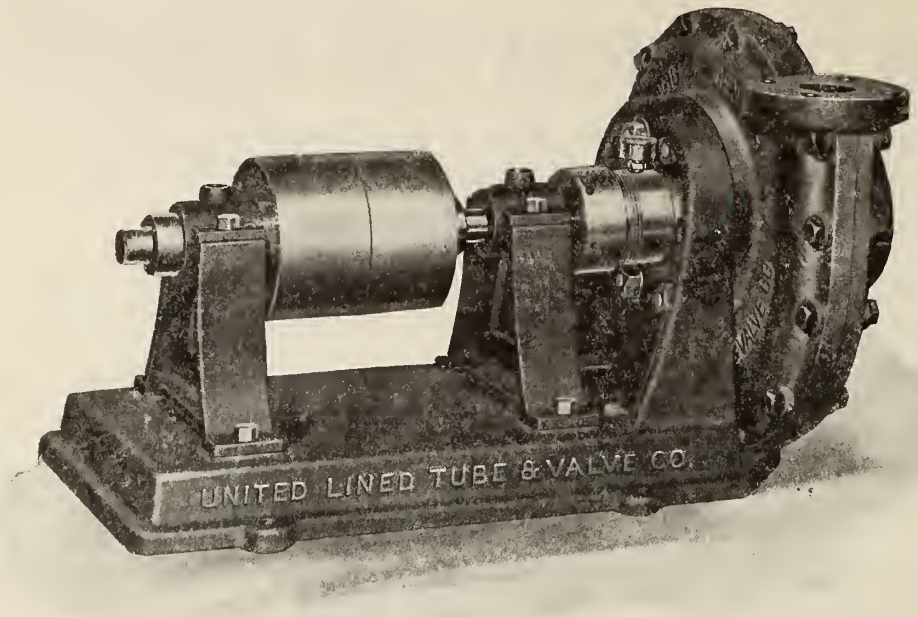

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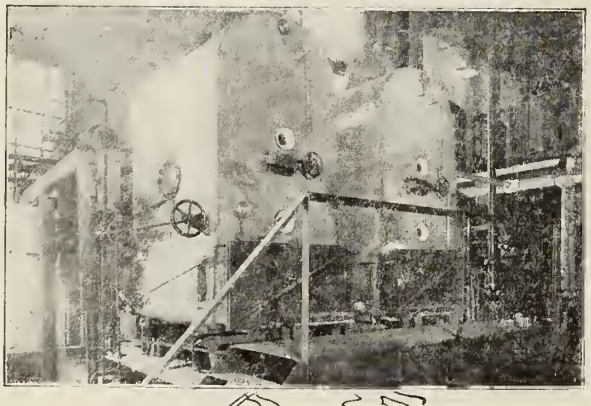

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THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

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NOTICE.—On and after January 1, 1921, subscription rates to Canada, British Empire, United States, and all foreign countries will be $3.00 per annum. Subscriptions and Renewals received previous to this date will be accepted at the present rates, $2.00 Domestic, $2.50 Foreign.

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EDITORIALS

THE MAN WITH AN IDEA.

THE man with an idea and that alone is in a poor way. If the genesis of most of our everyday machinery, not to mention those things which have made life in peace and war really "modern," was diligently sought out, it would very often be found that pearls, if not cast before swine, have been left lying around rather freely for some time.

We do not belittle the number of poor ideas that have been buried, but we do claim that no machinery has yet been created which is designed to give even a measure of classification to the new crop as it comes along. If anything could be done to accelerate the fruition of the really good ideas that are new and basic, and bring to bear upon them, the workable parts of others not so good, and do the whole thing in a national way, a new function of Government would be exercised.

To narrow the conception to particular instances, simply shows that while educational work is fundamental, applied research is even more necessary. We have many Canadian resources to which this scientific method of advance might be applied. The generality is true in everything, and whatever is done must have been done slowly, by a basic method. Some are satisfied with present achievements, while others are not. Consider pulp and paper, iron ore, coal, fisheries, textiles, shale, peat, lignite, or such a generality as metallurgy. There are nearly endless examples in these fields of men who have good ideas. They have worked night and day, and have expended vast sums of energy and often all the money they could earn in the development of an idea. They approach men with money. These gentlemen have their investigating engineers consider the matter, or they may dismiss it without thought. The idea goes begging for funds to give it a preliminary trial, even in a small way. Often advice is taken by capital from those who have neither the intelligence or desire to fully apprehend the possibilities of the idea. This man with the idea goes to the Government. With all due regard to technical officials of the Government, their narrow, practical experience does not always allow them to advise as fully as they should, and their position calls for caution at all times. Heads of departments have no time and departments have no money to separate the chaff from the wheat, and piece together the sound ideas into something that will advance our knowledge and help a certain industry. Public money is held in such sacred esteem and other claims are so insistent, that along scientific lines public men cannot vote money for anything that is in the development stage. It must be already of universal importance and in demand. The fact that it might become so by their aid is beyond them. Their political life is immediate, and their vision with it. If the demand for action comes from important quarters, a sop of one kind and another will be thrown out.

Such has been the heart-breaking history of the ideas of many good technical men, and others less brilliant, who, without funds, are unable to develop their ideas properly. We are not forgetting provincial and national undertakings where, after a time, governments have taken hold, but let there be some national or provincial machinery created whereby a man with an idea may be tried and found wanting or otherwise, and if it works as smoothly as our civil and criminal courts and is backed up by reasonable funds, a force would be created and applied to industrial life which would at once accelerate advancement and efficiency in a national way, perhaps beyond our present dreams.

If the smallest company can afford to pay a few dollars for a workable idea from one of its mechanics, need the nation hesitate to do its duty in the larger field?

PUTTING A STRAIN ON THE LABEL.

A RECENT bulletin of the Department of Health* is before us. The cynical disregard of results in unscrupulous competition is well brought to the attention of authority in this bulletin.

The subject is "Baking Powder." The function of baking powder is to produce gas for the leavening of bread. It is a substitute for the saleratus and cream of tartar of other generations. The delectable cookery that Grandmother put on the table may have owed some of its quality to the fact that cream of tartar and saleratus were compounds of uniform strength. Two teaspoonsful of cream of tartar (bitartrate of potash), and one teaspoonful of saleratus (bicarbonate of soda) could be counted on to produce as a general thing the same amount of gas.

Baking powders may now contain alum, alum phosphate, or acid phosphate of lime, in addition to cream of tartar. It is shown that yields of gas all the way from 3 per cent. to 16 per cent. may be had. Just imagine how much good cookery is spoiled by such wide variations, and how the nerves of our patient stomachs are tried in our loyal endeavors to

prevent embarrassment of hostesses or waste of food. We might let this pass as unintentional if injury were not deliberately discounted by the makers in the writing of their labels. Claims of absurd properties and value are made with reckless disregard of the intellectuality of the public.

One brand claiming to be the "Strongest powder on the market" appears three times in the list of powders failing to comply with the moderate Canadian standard of 10 per cent. available carbon dioxide. Two brands claim that with their use warm bread, biscuits, rolls, may be eaten without injury by dyspeptics and "persons of the weakest digestion."

It is to be hoped that the recommendations of the report may be embodied in some legislation to prevent such misleading labels from getting into the homes of the ignorant. Especially the recommendation that nothing other than the ingredients, date of manufacture, net weight and directions for use be permitted on labels.

We would strongly recommend better legislation to cover reckless claims in the advertising of foodstuffs generally, more severe punishment for false claims and adulteration and a little more difficult path established for those who desire to further their sales by misleading labels or statements.

*Bulletin No. 439, Food and Drug Laboratory, Department of Health, Ottawa.

POLITICS—A SLEEPING SICKNESS.

EVERY so often events, such as the continued delay in the establishment of some type of industrial research institute, occur in connection with the general relationship of the Dominion Government to the development of our resources on a scientific basis, which are enough to discourage even the most optimistic. Hope deferred is certainly killing the belief that the Dominion Government ever had any intention of doing its duty in the research development field. Members of Parliament have agreed and do agree individually that many things should be done; but when it comes to action they fall down most miserably. Votes count, ignorant, biased and simple-minded, and there seems to be a mistaken idea that strength of mind and character is synonymous with the expression of the loudest and most biased opinion. Extreme academic minds and practical idealists, as represented by men drawn from universities and professional fields, have tried to lead the old-time politician and resource-grabber to the point of action, with but little result.

We have in Ottawa to-day a few technical men who are able only to scratch at the work they should be doing. They obtain a measure of information with regard to our resources. After a great time, this is presented to the public. Their work should not be taken as final or as a full measure of what we should be doing. Sometimes individuals are able to profit by the work done and knowledge gained, but the public generally, and industries particularly, see little in the way of specific results. Why do governments fail to take hold and do things with our resources which they alone can do? It is sometimes easier to believe that the Government never intended to do anything with such conceptions as a Research Institute, than to feel that they were really interested in the vital developments to be made possible through it. To a certain extent, provinces have followed the lead of the Dominion. It is shrewd politics not to go too far with anything. Keep them all stringing along. Play one against the other. Occasionally throw out a miserable bone, like the half-way Industrial Alcohol Bill. Get a few important individuals to come from the United States and tell our Parliamentary Committees how valuable research is. If nothing follows, what a shame to waste a good man's time! Let us take a year or two ruling whether the Civil Service Commission or someone else should decide appointments to be made in a theoretical Research Institute, for which Parliament may some day vote money enough to plant flowers on the lawn.

If Canada does not wake up and do those things necessary to the full development of her resources for herself, she will find that capitalists from outside will be doing the research to suit their interests, and much of it will not be done in Canada. We are in a fair way to become a country whose resources are controlled by people who hold Directors' meetings in New York, London—anywhere but Canada.

The ignorance and apathy which exists as to what should be done now, from the viewpoint of the proper developments of Canadian resources along scientific and economic lines, is amazing. If the Governments, either Provincial or Dominion, are not big enough to make it their business to spend millions instead of thousands on some real interrelated economic development of resources, then there is little left to hope for except the possibility that some of our largest corporations will undertake the task and many of our smaller interests combine for the strength necessary to do development work as it should be done.

There must soon be a real show-down on the attitude of Governments in this regard, and in our opinion that Government will secure a new lease of life which takes hold and is not afraid to spend money, not only telling the people what they might do, but showing the people what they can do. The future of industrial democracies depends on the ability of elected representatives to act, lead and educate in an economic sense, as well as listen and shake hands. Both Capital and Labor are seeking

unconsciously and rather blindly for just such a leadership, but it will not be attained with our present system.

The objection to geographical representation is that the personnel of parliaments is not representative of the people. Geographical representation was sufficient when there were only two classes, lords and commons, but it is hopelessly obsolete. There is a movement in France and England for occupational representation. Such a parliament would not fail to appreciate properly the interests of the nation, and would not permit the domination of special interests, or the exploitation of national resources for private profit.

TARIFF ANOMALIES.

MR. WILSON'S letter, which we print in this number, provides interesting reading as to the devious ways of the tariff as it affects chemical work. That laboratory apparatus should be classed with vaults, hay scales and table wares, evidences little knowledge of, and less desire for, the promotion of scientific procedure in industry on the part of tariff framers. There is good reason for wishing to know something of the destination of stills, but if some, why not all, and if they are a menace under the prohibition law, why not keep them out, or why put a duty on them which would make it more profitable to manufacture them in Canada.

Mr. Wilson does not say why the dealers would prefer a duty rather than free entry. We are of the opinion that all scientific instruments not made in Canada should be admitted free, especially for use in industry where their use adds to national wealth, prevents waste and improves quality.

The delay due to customs, entries and methods is frequently not only exasperating in emergencies, but liable to be a considerable cause of loss, due to stoppage of work for lack of control, and expense in lost time for labor.

THE MENACE OF MARCEL.

THERE is a story told of a man who bought three silk shirts at $15.00 each. When the enterprising salesman, hoping to clean up the odd five of the fifty dollars, suggested collars, his customer averred he never wore collars and never would. We also heard of a man who had given up a private school to open a beauty parlor, and is now for the first time in the class that pays income tax.

He says young women with a marcel and massage weekly and good clothes can get $50.00 a week, and tips, and he comes to the conclusion that the outside of a woman's head is more valuable than the inside.

Consulting chemists may be called upon to spend some time on wrinkle chasers, face powders and de-capillary potions, and far be it from us to decry the subtle and delicate chemistry of them—though at times some careless compounder does use white lead in face powder.

Farther be it from us to injure the silk industry in any way. Both natural and artificial silks are triumphs of patient scientific work. There is, however, something in this painting of lilies and routing of pay envelopes that may well give us serious thought. Money, good clothes, and pleasure can be had without regard to finer things, without thought for others, or giving of service. In this is to be found one reason for apathy in the welfare of the community; one reason why lean Cassius who lies awake o'nights can turn the ballots of democracy into cogs for the machine.

There is a type of shallow mind which, we believe, was represented in the past in a religious phase, and which produced much bigotry and narrowness in thought and moral concepts. Their children in this generation are opposite extremists, bathing too freely in the froth of life.

The remedy is in better homes, better schools and more schools, and a deeper national and natural religious life—more effective churches—unfrightened, logical thinking and broader temperance in all things.

OIL AND ARSENIC.

HEARTENING news comes from the North that oil has been "struck" in good quantities, about 150 miles south of the Arctic Circle. Further developments will be awaited with great interest. It is a long way to go, but is only another case of lengthening the cords and strengthening the stakes. Who knows to what other fields we shall come in the northland. If the oil is there a means will be found to market it.

Then we find our old friend Hastings County to the fore again with the arsenic in its mispickel ores for insecticides and fertilizers. Arsenic has been used for such nefarious purposes that we find it hard to appreciate its good points. Central Ontario is both a cemetery of hopes and a land of promise.

NO OPEN VISION.

WHEN things were not going well in days of old, and inspiration was lacking, there was said to be "no open vision." One thing that is abundantly apparent about the evidence being submitted to the tariff commission is the limited viewpoint of advocates on both sides of the question.

The logical outcome in some cases would be free trade on some lines of goods in the East and protec-

tive tariff on the same lines in the West, or free trade in the center and protection East and West.

No better argument for a scientific, dispassionate tariff board could be adduced than the spectacle of this or that little selfish interest demanding protection or free trade with only its own special product or business in view.

Let us have more open vision.

CHEMISTRY ON THE ROSTRUM.

WE heard a well known public speaker drop this pearl to elucidate the advantages of getting together: "Chemists tell us that the union of an acid and an alkali precipitates a solution."

He must have been acquainted with some odd chemists.

LABORATORY EQUIPMENT AND THE TARIFF.

Editor "Canadian Chemical Journal":

Sir,—The present seems an opportune time to write you in regard to some of the inconsistencies in the Canadian Customs tariff in relation to scientific and laboratory apparatus.

I will not take the space to go into this very extensively, but the following few items will give chemists an idea as to what conditions are in this respect.

For instance, item No. 437 covers safes, doors for safes, vaults, scales, balances, weighing beams and strength-testing machines of all kinds, and under this number analytical balances, as there is no other provision made for them. The duty on all items covered by No. 437 is 30%.

Item No. 460 covers quite a number of articles of metal, including equipment for mining and metallurgical operations, such as furnaces, pyrometers, etc. No. 460 is a free item. The pyrometers come in free, but, strange to say, the furnaces do not. If they are electrically heated they are then classed as electric apparatus. If they are gas heated, they then become gas apparatus, and, as we pointed out to the Commissioner of Customs some time ago, it is quite evident that the only furnace that can come under free entry is a heatless furnace. We have not seen any of this type yet, but perhaps the Canadian Customs know of such a furnace.

Item No. 363 covers platinum wire, platinum in bars, strips, sheets and plates, and all are entitled to free entry.

Item No. 489 covers platinum crucibles. This is also free entry, yet if you imported a platinum dish it becomes dutiable at 17½%. In other words, it comes under manufactures of platinum "not otherwise provided."

The porcelain crucibles, dishes, mortars, pestles, and all other laboratory porcelain are classed under item No. 287, which covers porcelain tableware, such as cups and saucers, at 27½%. Can you see any reason why porcelain crucibles and laboratory porcelain in general should not have another classification? 27½% is a high duty on this class of goods.

Now as to flasks, such as volumetric, Florence and others, they come under 32½%, which includes glass demijohns, decanters, lamps, chimneys, etc. It seems a shame that Florence, volumetric and distillation flasks of this kind should be classed with beer bottles.

There is another item which is working quite a hardship on the laboratories. This, however, is a Federal matter, and is due to the Ontario Temperance Act; that is, distillation apparatus. Every laboratory needs distilled water, and if you have a still with a capacity of three gallons or over you must pay a license fee of $25 per annum. There is nothing to prevent you, however, from having three one-gallon stills, as far as we know. In addition to this, dealers and manufacturers have to pay a license on top of this for all stills. This, of course, does not prevent the selling of condensers or distillation flasks. What is referred to above is the ordinary metal laboratory still.

"The whole thing," we were going to say, "is a huge joke"; but it is too serious to be treated as a joke. It is a hardship, and one that is not helping the chemical industries of Canada at all, but, from our experience, is retarding conditions considerably. It would be no advantage to us, as dealers, to have the duty removed, rather the contrary; but our interest in chemistry is such that we would be glad to see a complete tariff reduction in regard to all chemical apparatus. There is no provision at all for laboratory supplies in Canada at the present time, and in our opinion the laboratory business here is a key industry, and should receive preferential treatment. A flat tariff on all laboratory apparatus and C. P. chemicals should be sufficient, until such a time as manufacturing is carried on here on a large scale.

Yours truly,

J. H. WILSON,

President, Canadian Laboratory Supplies, Ltd.

Toronto, October 18, 1920.

The Editor, Canadian Chemical Journal:

Dear Sir: The sketch of the life of the late Dr. W. H. Ellis, which appears in your October issue, was written in Muskoka a few days after his death, and I was unable to consult anyone in regard to certain details. Mrs. Ellis has called my attention to the fact that I have made two errors, and I should be very much indebted if you would permit me to correct these. At the same time I am able to furnish some further details in regard to Dr. Ellis' early career.

He was born at Bakewell, Derbyshire, on November 23, 1845, and came with his father, who was a Doctor, to America at the age of 12 years, and thence to Canada at 14. He received his B.A. in 1867, his M.A. in 1868, and his M.B. in 1870, after which he went to London, England, and obtained a position on the house staff of St. Thomas Hospital. The Franco-Prussian war had broken out, and Dr. Ellis offered his services, but after having had his trunk packed for over a week, he was finally notified that ararngements could not be made. In July, 1871, he became a Licentiate of the Royal College of Physicians and Surgeons, and, returning to Canada, commenced practice in Toronto. After a short time he became Lecturer in Chemistry at Trinity University, and later undertook the instruction in Chemistry in the College of Technology. Although only for a brief period he did, therefore, practise as a physician, and he did not hold the position of Assistant to Professor Croft, as stated in the sketch.

Yours faithfully,

J. WATSON BAIN.

WESTERN CANADA SELF-SUPPORTING IN COAL.

That Western Canada, indeed, all territory west of Fort William, Ontario, can and will become self-supporting in coal, appears to be the ideal kept in mind by those citizens of Alberta who have the best interests of their province at heart. This is evidenced by the splendid co-operation now being shown by the Government of Alberta, the University of Alberta, and the coal operators and dealers. This co-operation was much in evidence at the first annual convention of the Coal Operators and Dealers of Western Canada, held in Calgary during the third week in August. The convention was called at the suggestion of the Minister of Mines of Alberta, and Dr. Tory, President of the University of Alberta, was one of the principal speakers. In his address Dr. Tory stated that two of the ablest and most suitably trained chemists available in Canada had been secured for the University, and that in a year the University expected to have five men employed on research, principally on coal storage, and the peculiar problems of Western coal. Dr. Tory correctly pointed out that there was no need to stress the amplitude of the coal resources of Alberta. "We have not found out what these are," he said, "but we have undoubtedly the greatest united body of coal resources to be found in any place in the world, with probably one exception, and it is necessary that this great asset should be developed."

Much time was devoted at the convention to the consideration of railway rates on coal, and the concensus of the opinion expressed seems to be that the railways have not considered the coal traffic of the West as seriously as they might. It was pointed out that in the future the carriage of coal will be the most important function of the railways running through Western Canada, and if properly provided for would provide the bulk of the freight revenues.

DANGER IN USING ARMY GAS MASKS IN MINES.

The successful use of the gas mask by the American Army in France in combatting the poisonous gases of German shells caused many army men to feel that the gas masks were proof against any kind of gas which might be encountered. The result has been that from time to time there have been reported in the press deaths of former army men through using their masks to enter various kinds of gases, such as illuminating gas, gasoline vapor, and the gaseous atmospheres produced by mine fire. Such a case has just been reported from a mine in Copperopolis, California, where a former army man lost his life in descending a mine shaft filled with the fumes of a mine fire. Another man who, in attempting to rescue him, merely used a dust respirator, lost his life also.

While the American type of the army gas mask was developed by the Bureau of Mines for the War Department, and since the war a section of the Bureau's investigative force has been developing industrial gas masks for certain specific gases, the Bureau has repeatedly called to the attention of the public the fact that such masks have serious limitations, and in no case should a gas mask be used in underground workings for the reason that there may be an insufficient amount of oxygen to breathe (and the gas mask does not supply oxygen), or there may be present carbon monoxide, which the army mask will not remove, and there always is some carbon monoxide produced by a mine fire or by a coal-mine explosion, or by a blast of dynamite or other explosive.

It is true that the Bureau has been developing a mask which may take care of a small percentage of carbon monoxide, that is, one per cent. and under, but in mine fires and after explosions, there may be, and frequently is, a much larger percentage of carbon monoxide in the mine atmosphere. Masks such as these, for small percentages of carbon monoxide and associated gases, are for use in connection with industrial surface plants, as, for example, on the top of a blast furnace or around gas producers in the open air.

Even when a test has shown only a small amount of carbon monoxide present in a mine one cannot tell, on account of the rapidly changing conditions caused by the fire, whether within a short distance there may not be high concentrations fatal to life.

Finally, it cannot be stated too positively that a mask is not the slightest help when there is a deficiency of oxygen, and this deficiency is always present in the immediate vicinity of a mine fire, usually accompanied by the presence of both carbon dioxide and carbon monoxide. In many places the presence of carbon monoxide is frequently unaccompanied by any warning, and if a man enters a place in a mine which contains less than 8 or 10 per cent. of oxygen, he is likely to drop in his tracks without receiving the slightest premonition of his collapse.

Numerous instances have occurred where gas, such as fire-damp (methane), has been gathered in a pocket in the roof, and men entering the place have immediately lost consciousness. Where they have been dragged out immediately and revived, the impression of the victims has been that they have been knocked down. In the case of the Copperopolis Mine it is reported that a miner undertook to go down the shaft of a mine in which there was a fire, using the army gas mask which he had used overseas. It later proved that he was overcome and fell off the ladder into the sump. As he did not return two rescuers attempted to go down, wearing ordinary dust respirators, which, of course, are valueless against gases. One of these men also fell off the ladder into the sump; the other man managed to get back into a skip and gave the signal to hoist, but when he reached the surface he was unconscious and had to be revived by artificial respiration. The two bodies were later recovered from the sump by rescue crews, wearing Bureau of Mines breathing apparatus, under the supervision of Bureau of Mines engineers.

This striking case presents an illustration of the absolute failure of the army gas mask and the success of the self-contained oxygen breathing apparatus in an irrespirable mine atmosphere.—George S. Rice, Chief Mining Engineer, U.S. Bureau of Mines, Reports on Investigations.

REVISE PETROLEUM SPECIFICATIONS.

At a meeting of the technical sub-committee on Standardization of Petroleum Specifications, held at Washington, D.C., October 18th-20th, comments and suggestions were received from representatives of technical societies, oil refiners, and automobile manufacturers, regarding the specifications for lubricants used by the Federal Government, drawn up at the meeting of the sub-committee last March. There proved to be little criticism of the lubricant specifications, but the refiners were almost unanimous in asking that the 90 per cent point of the gasoline specification be raised a little. The use of the New Saybolt Fuel Oil Viscosimeter was advocated by the refiners, to test the fuel oils used by the Army, Navy and Shipping Board, to replace the specific gravity determination required at the present time. It is probable that a complete and revised code of specifications for all petroleum products will supercede the specifications drawn up in March, and which were published as Bulletins 1, 2, 3 and 4 of the Committee.

Light, Heat and Power

Canadian Oil Shales an Economic Substitute for Coal—Advantages of Shale Oil Over Coal—Present Custom Duties and War Tax on Machinery for Mining Prevent Development.

By LOUIS SIMPSON

LIGHT, Heat and Power are essential to modern industrial life. Of the three, heat is probably the most important. With heat available, light and power can generally be economically provided.

Heat can be commercially obtained by the combustion of various fuels, as, for instance, wood, peat, coal, oil, natural and artificial gases also by the use of electricity, which may be the product of hydraulic or of other power.

Of the several sources of heat, that obtained from the combustion of coal is the one usually employed, but the use of natural gas and of fuel oil have often proven to be less costly.

The cost of light, heat and power consists of the interest and depreciation of the plant, plus the cost of the fuel and material (including that required for repairs), plus salaries, wages and sundries.

The cost of the fuel and material is largely governed by the cost of assembling the same. Fuel that may be low in cost, when used at one works, may be found to be very costly when transported to another. This condition applies equally to electricity, the transmission and distribution of which may easily, and generally does, cost more than the generating.

The present, and probably future, high cost of coal fuel, delivered to the factories of Eastern Canada, makes the economic production of light, heat and power of unusual importance.

The factories of the Provinces of Ontario and of Quebec are to-day almost entirely dependent upon the United States for the coal required, and there would appear to be small hope that a home supply of coal will ever eventuate. To be thus dependent upon a foreign country is not wise, and is certainly not a good policy, even when that country is a friendly one, and such dependence is, to-day, responsible for the adverse rate of monetary exchange that exists between the two countries. Those that have the best interests of the Provinces named at heart have long sought for an economic substitute for the coal. Such a substitute has been found in the oil that by retorting can be obtained from certain shales that are known to exist in large quantities, not only in those Provinces, but also in the Provinces of Nova Scotia, New Brunswick, Manitoba, Saskatchewan and British Columbia, and which probably will be found in the Province of Alberta.

Advantages of Shale Oil Over Coal.

The fuel oils that may be obtained from the shales have the following advantages over coal fuel:

A.—The same weight contains more heat units.
B.—A higher efficiency can be obtained when burned.
C.—The cost of storing is less.
D.—The cost of firing is less.
E.—The cost of repairs is less.

At the same cost per 1,000 British thermal units contained in the same weight, fuel oil is by far more economical to use, but fuel oil commands a higher price. In Canada it has hitherto been difficult, often impossible, to purchase a straight fuel oil; at times the only oil available has been oil composed of the waste and rejection of oil refineries. Such conditions would cease to exist were Canada's deposits of oil-yielding shales turned to commercial use.

That it is often economical to use fuel oil in place of coal, even when the relative cost is higher, has been demonstrated. Johnson and Huntley, in Oil and Gas Production, page 9, quoting a test made by M. J. O'Shaughnessy, of New York, upon sister ships, running between New York and Montevideo, one using coal and the other fuel oil under the boilers, both vessels being equal in horse-power and displacement, give the following:

	Coal.	Oil.
Time taken by voyage	29.4 days	27 days
Gain in time when oil-fired		2 4-10 "
Wages	$249.70	$87.00
Saving in wages when oil-fired		$162.70
Excess freight-carrying capacity when oil-fired		1,219 tons
Revenue from such excess		$7,314.00
Saving over coal, ignoring cost of fuel		$7,476.70

As the cost of the coal was $2,437.48, it is evident that the oil might have cost $9,914.18, or four times the cost of the coal, and yet the oil would have been the more economical fuel, if only because the voyage occupied nearly 9 per cent. less time. Had internal combustion engines, using a suitable fuel oil, been installed, the quantity of oil used would have been decreased as 25 is to 10, that is, less than half the oil would have been required. The excess freight-carrying capacity would have been correspondingly increased.

Hence it is evident that it is not correct to compare only the cost of the British thermal units, contained in the two fuels, even were the possible efficiency of combustion equal, which is not the case.

The Wickes Boiler Co., of Saginaw, Mich., have published a Bulletin (No. 4), in which is given a table enumerating the several losses that reduce the possible efficiency of coal fuel. The efficiency claimed for excellent practice is 80 per cent. Had fuel oil been burned under similar excellent conditions, the efficiency would have been 90 per cent.

Instances are quoted where the efficiency of burning coal was under 60 per cent., indeed, as low as 35 per cent.

It is much more difficult to burn coal efficiently than it is to burn fuel oil or gas.

It is evident, though it is seldom so done, that the heat value of coal, as compared to other fuels, should not be taken as from the British thermal units contained, but should be taken as from the B.T.U. in each case, less their respective loss in efficiency.

Thus coal containing 12,000 B.T.U. per pound, with a possible efficiency of 80 per cent. and a probable effici-

ency of 60 per cent., is to be compared against fuel oil containing 20,000 B.T.U. per pound, with a possible efficiency of 90 per cent. and a probable efficiency of 80 per cent.

	B.T.U.	Possible Efficiency.	Probable Efficiency.
Coal . .	12,000	9,600 B.T.U. @ 80%	7,200 B.T.U. @ 60%
Fuel Oil	20,000	18,000 " " 90%	16,000 " " 80%
Comparative value of one lb. fuel oil as to coal..		nearly 2 lbs.	nearly 2¼ lbs.

At 35% the eficiency value of the coal would be only 4,200 B.T.U., and one pound of oil would, in this case, have an efficiency value of nearly four pounds of coal. It will be asked why it is not possible to secure an equal efficiency, when burning coal, as can be secured when burning a proper quality of fuel oil. Apart from the losses which are inherent to the consumption of coal, it is not practicable to burn coal with an efficiency equal to that possible when burning a good quality of fuel oil.

Canadian Shale Deposits Neglected.

Oil, the product of oil-yielding shale, has been commercially marketed in Scotland for many years. Canadians have hitherto neglected to use Canada's undeveloped supplies of similar shales. So has the United States; but the States had, and have, good excuses in her then superabundant supplies of flowing oil, natural gas and coal.

Canada's deposits of oil-yielding shale, although very extensive, are not, as a rule, as rich in oil as those found in the United States. For this reason, if for no other, it is necessary that the Canadian Government make it possible for these shales to be mined and retorted at a cost as low as possible. It is important to Canada that every ton of shale that contains oil should be retorted, and shale of a low oil-content can only be retorted when the cost is kept down.

Up to date, the Canadian Government, by insisting that import duties and war taxes be collected upon the implements and machinery required to mine and retort these shales, has prevented the birth of a new industry.

Canada has, however, in certain of the deposits, one advantage over Scotland. In Scotland, all the shale has to be mined by deep mining, whereas in Canada certain large deposits can be mined by shovel work. Such deposits, however, cannot be profitably worked unless works of large capacity are built, and such works cost money. No wonder capitalists decline to build large works, incidentally paying the Government large sums of money in customs duties for the privilege of risking further large amounts of capital in the initiation of a new industry.

The cost of production is chiefly that of mining and of the interest and depreciation upon the machinery and the works. Hence is it that the continued action of the Government has absolutely prevented Canada from gaining the industry and all manufacturers in Canada (East) from having the vital benefits of an assured fuel supply at prices more reasonable than have lately been demanded.

Some ill-informed persons have suggested the bringing of coal from Alberta for use by Eastern manufacturers. Seeing that the freight rate from Drumheller to Sudbury and Toronto is $1.30½ per 100 lbs., or $26.10 per 2,000 lbs., it is manifestly impossible that Alberta coal can be used in Ontario, at Sudbury or east of Sudbury. The cost of such coal delivered, including shunting or carting, and a reasonable overhead, would considerably exceed $30 per 2,000 lbs., in fact would approach $40 per ton. Government officials have, in the past, done great harm by writing and speaking upon Canada's coal deposits, without making plain to the public that the immense deposits of coal and lignite known to exist in Western Canada cannot find a commercial market in Eastern Canada.

Summary of the Situation.

The position as it is at present is: There are large deposits of shale, lean as to its oil content, but located in those parts of Canada that are without coal. These deposits can be mined and the oil can be educed, providing capital is available for the construction of the necessary works. Capital will not be available, so long as the Government of Canada penalizes the still to be born industry, by the imposition of heavy customs duties. It is remarkable that the Government that so strongly advocates the protection of industries, especially new industries, and more especially industries that will cause the development of Canada's natural and undeveloped resources, should have, up to now, refused to grant the relief necessary to secure the birth of this new industry.

There are some very pretty questions that require suitable solutions, but none are of such a character that time and common sense will not solve. Most are already solved. When difficulties are recognized, they are half-solved. Much trouble has, in the past, been caused by the claim of the Scotch shale operators that their system of treatment was the only possible one for all qualities of shale, whereas it is now known that every shale has to be retorted according to its own merits or demerits, and also according to the local conditions existing, where the shale is located.

It has lately been claimed by some that for the well-being of Canada it is necessary that Canada should not be dependent upon other countries for the iron ores required to fill her requirements of iron and steel. Necessary as iron ore may be, iron ore is not as necessary as is fuel. Without fuel, iron ores, and indeed most ores, would be of small value.

DISTILLERS WHO MAY DENATURE ALCOHOL.

As announced in our August number, the Department of Inland Revenue, Ottawa, has handed over to the distillers the denaturing of alcohol, formerly only carried on at the denaturing plant of the Department at Ottawa. It is expected that this forward step in the handling of industrial alcohol will eventually result in a decrease in its price, owing to the freight charges saved in shipping to and from Ottawa. The Department of Inland Revenue has named the following nine distillery companies as producers of denatured alcohol, and who are to supply the demand:

The Canadian Industrial Alcohol Company, Ltd., Corbyville, Ont.; The B.C. Distillery Company, Ltd., New Westminster, B.C.; Hiram Walker & Sons, Ltd., Walkerville, Ont.; Joseph E. Seagram, Waterloo, Ont.; Gooderham & Worts Ltd., Toronto; J. P. Wiser & Sons, Ltd., Prescott; Montreal Products Company, Ltd., Montreal; St. Hyacinthe Distillery Co., Ltd., St. Hyacinthe, Que.; and the Melchers Gin and Spirits Distillery Co., Ltd., Berthierville, Que.

CAPE BRETON GYPSUM EXPORTS RESUMED.

The first shipment of gypsum since operations were resumed after the war has been made by the Iona Gypsum Company, with quarries at Iona, Cape Breton Island. The shipment consised of 2,500 tons for Philadelphia buyers. Before the war Philadelphia did considerable business with the Iona quarries.

Experiments on the Corrosion of Iron and Steel

Passivity of Iron as an Oxidation Phenomenon—Oxygen Dominates Over Composition of Metals in Initial Corrosion—Results of Extensive Experiments.

By WILLIAM D. RICHARDSON

(Concluded from last month.)

Passivity of Iron Considered as an Oxidation Phenomenon.

When either commercial or electrolytic iron is immersed in strong oxidizing agents such as chloric, chromic or fuming nitric acids, or when touched with gold or platinum while dissolving in nitric acid of sp. gr. 1.35, or when heated momentarily in air, or when it is made the positive electrode in an electrolyte containing oxygen, it becomes passive and thereafter is not attacked by ordinary acids, no longer precipitates copper, silver or lead from their salts and in general behaves like a noble metal.

All of these processes for producing passivity in iron are oxidizing processes.

Passive iron may be reactivated by heating in a reducing atmosphere, by the action of water, salt solutions, the diluted common acids, by making it the cathode in an electrolyte, and by other means.

All of the processes for reactivating passive iron are reducing processes, since hydrogen is disengaged in all of them, including contact with water and salt solutions, as in the ordinary process of corrosion in water.

Iron made passive either by fuming nitric acid or by chromic acid is electro-negative to ordinary iron, but the behavior of the passive surface in the two instances is somewhat different. The passivity conferred by chromic acid is more permanent apparently than that produced by nitric acid, which seems to be somewhat transient and evanescent. If a clean untreated strip of iron is tested against a strip made passive by nitric acid, in water acidulated with H_2SO_4, the circuit being completed through a sensitive galvanometer, at first the needle is strongly deflected in the sense that the untreated iron is positive to the passive iron, but suddenly the passivity leaves the treated strip, the needle of the galvanometer moves to o, then it continues beyond and the current is reversed. This reversal persists for a long period of time. If a strip of iron be passivated by chromic acid the reversal of polarity occurs slowly and gradually in unacidulated water. However, if the test be made in water acidulated with sulphuric acid, the same general behavior is noted as in the case of nitric acid and the depolarization and reversal of current take place with startling rapidity.

The same behavior and reversal of current occurs if mill-scale-covered iron is tested against iron made passive by chromic acid. At first the mill-scale-covered iron is positive to the chromic-acid-passivated iron, but soon a reversal occurs. If nitric-acid-passivated iron is tested against mill-scale-covered iron (clean iron-held momentarily in the oxidizing flame) the nitric-acid-passivated iron is at first positive to the magnetic oxide. Later a reversal occurs, the mill-scale-covered iron becoming positive to the nitric-acid-covered iron. Sometimes when testing magnetic-oxide-coated iron against nitric-passivated-iron, the action starts with one strip neutral to the other, then suddenly the nitric-passivated iron becomes strongly positive to the magnetic oxide. This gradually diminishes and the magnetic oxide becomes the positive pole and this reversal persists for a long time.

If two strips, the one treated with chromic acid and the other with fuming nitric acid be tested against each other through the galvanometer, they seem to be neutral at the beginning, but very soon the nitric-acid-treated strip becomes positive to the chromic-acid-treated strip. The former has lost its passivity and again become active iron, which can be demonstrated by its action on nitric acid. These facts suggest but do not prove that there may be different degrees of passivity and that iron made passive by chromic acid assumes a higher degree of oxidation than that made passive by nitric acid. Furthermore, iron made passive by nitric acid appears to be of lower degree of oxidation than magnetic oxide of iron and the latter of a lower degree than iron made passive by chromic acid as judged by galvanometer tests and loss of passivity. The following electrochemical series suggests itself on the basis of these experiments and others reported in this paper:

\+

Iron+adsorbed hydrogen (from acid).
Ordinary bright iron exposed to air.
Iron made passive by nitric acid.
Magnetic oxide of iron (Fe_3O_4).
Iron made passive by chromic acid.
Oxygen.

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Ferric oxide (Fe_2O_3) is not placed in the above series and its exact position has not been determined. On account of its higher oxidation it should be more electro-negative than Fe_3O_4, but its relation to iron made passive by chromic acid has not been ascertained.

The explanation of the sudden reversals may not lie in successive degrees of oxidation as suggested by the electrochemical series given above. The reversals may be due merely to the fact that one type of passivity (including magnetic oxide passivity induced by the flame) becomes activated when connected in a circuit more speedily than another. However, there appears to be something more than this to the phenomena and direct and reversed currents appear to demand the above serial arrangement of the surfaces producing them.

In neutral salt solutions the first reversal of current occurs much more slowly than in acidulated water, hours being required where seconds suffice in the presence of acid. In water also the same rule holds.

Although iron made passive by nitric acid and by chromic acid are both electro-negative to ordinary iron, this fact is not easily demonstrated by the use of the ferroxyl indicator, owing, no doubt, to the fact that when this indicator is applied hot in agar jelly, the passivity of the metal is soon lost. The ferroxyl indicator generally shows negative areas most promptly at the oxygen contact rim of the jelly, next at any rust spots, then where mill scale occurs. If the passivity could be retained, undoubtedly the appearance of red negative areas would correspond to the posi-

tions of oxygen, oxides of iron and passive areas according to the order shown in the above electrochemical series. It might be possible to develop a special ferroxyl indicator which would produce these results, but experiments have not been carried that far.

The oxide theory [1] of passivity apparently offers the best explanation and even though no actual oxides are formed on the surface of the iron, an equivalent gain in valence or loss of electrons can be visualized by the oxidation hypothesis, and suggests an interesting parallelism between passive iron and iron covered with mill scale and adherent rust. This parallelism may be stated as follows:

If all exposed pure iron surfaces in the crystallographic sense are uniformly covered by a layer of oxide, either thin or thick, and if this film be tightly adhering, no corrosion takes place. A sub-microscopic film may be assumed to be produced over an iron surface by immersion in strong oxidizing agents such as chromic and nitric acids (the passive layer), a thicker and visible layer by an oxidizing flame (mill scale) and a more irregular and thicker layer during corrosion under certain conditions (rust). All three types of oxide layers protect against corrosion. However, if portions of such surfaces are removed by either physical or chemical means, corrosion starts at once, the abraded or dissolved areas becoming electro-positive and the oxide areas electro-negative. In all cases corrosion is prevented or delayed until the film of oxides is lifted or removed. Iron surfaced in any of these ways may in a very large and general sense be considered passive as regards corrosion in substantially the same sense, namely, by the uniform action of oxygen on exposed ferrite areas. There may be some doubt about the exact condition of the surface in passive iron induced by treatment with oxidizing agents, one view holding that the surface is simply polarized, another that it holds condensed or occluded oxygen, and another that a sub-microscopic layer of oxide has been formed, but there can be no difference of opinion about oxygen being the active agent. In the case of iron surfaces coated with magnetic oxide, the nature of the protection against corrosion is obviously both electrical and mechanical. When such a protective layer of magnetic oxide is lifted from the iron surface in places by a film of water or is removed from certain areas mechanically, the remainder acts as an accelerator of corrosion and deep pitting generally results. This is also true for adherent rust. It probably would hold for passive areas provided these could be maintained in place for considerable periods of time.

Ferroxyl Indicator on Polished and Etched Surfaces.

The initial rusting of a clean iron surface determines to a great extent the subsequent course of the rusting process. The first rust formed may be loosely or tightly adherent, may be more or less granular or in the form of a continuous film (depending on conditions), and as the rusting proceeds the rust formed will have or acquire different physical characters, depending on the composition or physical character of the metal affected and on the conditions promoting the corrosion. Any sort of iron oxide, including mill scale or iron rust, in close contact with any of the ordinary varieties of iron, stimulates corrosion unless it be in the form of a protective coating adhering closely enough to prevent contact of water with the iron beneath it and in any case profoundly modifies the course of the corrosion. If a drop of water be placed upon a clean surface of iron, cast iron or mild steel, or any of the ordinary varieties of iron, and allowed to dry a spot of rust will be formed. If the entire surface of a clean piece of iron be moistened and if the surface be free from oil or grease so that the water spreads over it rather uniformly, certain irregular areas will be covered with rust and other areas will not—the rusting will not be uniform, although the rust areas in some cases are large patches and in other cases very small, in the form of specks or flakes of rust. If initial rusting were guided and determined by the composition of the iron, one might naturally expect that the rusted areas would bear a definite relationship, when examined under the microscope, to the crystallographic structure of the metal and that if the corrosion took place under carefully regulated conditions that the ferrite areas would become anodes and produce rust spots corresponding to them in area, and that various segregated impurities in the iron would become cathodes and would remain bare of rust in the initial rusting, or until colloidal ferric hydroxide, moving with the electrolytic currents of corrosion, deposited on them. Nothing of this sort can be observed under the misroscope, however carefully the rusting process is conducted.

In order to ascertain whether in fact ferrite areas are by their nature anodes and areas of impurities cathodes, in the rusting process, use was made of the very sensitive indicator developed by Messrs. Cushman and Walker and named by them ferroxyl indicator. Samples of all of the irons used for Series 4 corrosion experiments were polished on the wheel in the ordinary way and slightly etched by nitric acid in alcohol. After the etching the acid was removed by immersion in successive beakers containing absolute alcohol and finally with ether. Different procedures were followed, some of the samples being dried after alcohol treatment and some after ether treatment. Duplicates were dried in the air and in hydrogen and various modified manipulations were made use of. Standard ferroxyl indicator in agar was dropped on the surfaces thus prepared and observations made by means of a microscope of moderate power. The crystallographic structure of the metal could be readily seen and the development of the blue and red areas in the jelly could also be followed. If initial corrosion were determined by the composition of the metal, the red and blue areas should bear a definite relationship to the crystallographic structure of the metal and it would be natural to expect blue areas to form only over ferrite areas and red over impurities of various sorts. However, the red and blue areas in no case bore any definite relationship to the crystallographic structure. By no manipulation which was used could red and blue areas be made to coincide with crystallographic areas. I do not wish to convey the impression that it would be impossible to refine the manipulation to such a degree that this correspondence might not be brought about, but in any of the manipulations adopted with any of the samples experimented on, it did not occur. Mild alkaline solutions were tried for the neutralization of acids used in etching, the alkali afterward being removed by absolute alcohol and ether and the drying being

[1] Dr. H. G. Byers does not accept the oxide theory of passivity, although he offers no substitute. Abstracts of his extensive investigations are found in C. A. 3, 274, 4, 1933, 6, 452, 7, 317, 7, 3268, 8, 3738, 10, 717. The original papers are as follows: "The Passive State of Metals," J. Am. Chem. Soc., 30, 1718-42; "The Influence of the Magnetic Field on the Passive States of Iron," J. Am. Chem. Soc., 32, 750-6; "The Influence of the Magnetic Field on Passive Nickel and Iron," J. Am. Chem. Soc., 33, 1757-61; "Passivity of Iron Under Boiler Conditions," J. Am. Chem. Soc., 34, 1368-79; "Relation Between the Magnetic Field and the Passive State of Iron," J. Am. Chem. Soc., 35, 759-67; "Passivity of Metals," J. Am. Chem. Soc., 36, 2004-11; "Anodic Relations of Passive Iron, with notes on Polarization Potentials as Influenced by Gas Pressures," J. Am. Chem. Soc., 38, 362-74 (1916).

conducted both in air and hydrogen. But in this series of experiments the results were like the previous ones in that there was no correspondence between crystallographic areas and anode and cathode areas as indicated by the ferroxyl reagent.

Oxygen Dominates over the Composition of Metal in Initial Corrosion.

All of the above experiments indicate what must have been thought by many experimenters on corrosion, that some influence dominates over the composition of the metal in determining at what points or over what areas the initial corrosion may begin. This dominating influence in initial corrosion is undoubtedly oxygen. It may be oxygen which has been occluded or adsorbed by certain areas of the metal as opposed to other areas or it may be that some oxide or sub-oxide has been formed on certain areas in the form of an invisible film, but in any case the determining influence is oxygen whether free or in combination or held to the surface by occlusion or adsorption. That it dominates over metal composition in the initial stages of corrosion can be readily demonstrated by the fact that the red areas produced by the ferroxyl indicator extend over comparatively large surfaces, considered from the standpoint of crystallography, including very many ferrite crystal surfaces in the case of a mild steel or pure open-hearth iron. In instances where we might expect blue areas over ferrite we find red areas, and this occurs again and again in the experiments detailed above. The same observation holds for all the kinds of iron and steel, included in the Series 4 Experiments, including the cast metals. Oxygen, then, and not the composition of the metal, should be considered the dominant factor in determining initial corrosion in the case of any of the ordinary varieties of commercial iron and steel.

Why the oxygen of the air influences considerable areas to become electro-negative is difficult to say. An ordinary iron surface is a very sensitive one as regards corrosion. The slightest film of iron oxide over pure iron makes such an area electro-negative. Areas which appear tarnished and exhibit thin-film phenomena are electro-negative with reference to non-tarnished areas. The tarnish probably consists of an extremely thin film of iron oxide, or if the area has been in contact with acid, of an iron salt, probably a ferric salt.

Coupled with these facts is the one that passive areas produced on clean iron surfaces are electro-negative, and that when such areas are produced by means of chromic or nitric acid there is practically no loss of lustre and no visible change on the surface.

By the various means enumerated it was not found possible to cause the ferroxyl indicator to reproduce the metallographic pattern of the various irons and steels used in Series 4 Experiments (and others) in red and blue. The question remains whether by the use of other etching solutions and by taking the greatest care to avoid the effects of oxidizing acids and other chemicals and of atmospheric oxygen, a surface might be produced which would give such a pattern. One cannot doubt the possibility, and for the sake of the argument it may be assumed that under ideal conditions such a surface might be produced, and that the reds and blues of the ferroxyl indicator would then conform to the metallographic pattern. However, the very difficulty of producing such an ideal surface and the ease with which its delicate equilibrium is upset by all sorts of agencies, chief of which under ordinary conditions is atmospheric oxygen, leaves the general argument unchanged, and affords one more proof that composition of the metal, in the case of ordinary irons and steel, does not determine corrosion in its initial stages, but, on the contrary, composition is easily overbalanced and dominated by oxygen and oxidizing agents as well as by the products of corrosion. Everything indicates that the ordinary clean iron surface is exquisitely sensitive to numerous influences affecting corrosion, chief among which under ordinary circumstances are oxygen and the oxides of iron or rust.

The Role of Oxygen.

The importance of oxygen in the corrosion of iron was pointed out by William H. Walker as early as 1907, and was emphasized by him and others subsequently. Walker is of the opinion that when oxygen acts in such a way as to further the process of oxygen that it does so by its action on the hydrogen film, which otherwise would bring the action to a close. That this action occurs, and that it is catalyzed under certain conditions more than others, cannot be doubted, for example, at the surface of certain metals and possibly iron, platinum, etc., more than other metals, but there is also the explanation that it may act simply and directly on the ferrous ions, changing them to ferric, and thus permitting more ferrous ions to enter the solution to restore equilibrium. At any rate, this would seem to be an explanation which accounts for the marked difference in behavior under corroding influences in the absence and presence of oxygen of such bivalent metals as aluminium and zinc as compared with iron and manganese, which are both capable of forming higher oxides and hydroxides.

The Role of Rust.

Perhaps the most definite statements concerning rust as an accelerator of corrosion come from Friend.[2] He observes: "When iron has once begun to rust in air, further corrosion proceeds rapidly, until the whole surface of the metal is oxidized, even although the temperature of the air is well above dewpoint, so that a piece of bright iron exposed in a similar manner would remain unaffected for an indefinite time." He rejects the suggestion of Kuhlmann[3] that rust acts as an oxygen carrier, and thus catalytically assists further corrosion. He upholds the view held by Hutton, Crace Calvert, Wagner and Crum Brown to the effect that rust is decidedly hygroscopic and becomes charged with water in an atmosphere in which bright iron would not be affected.

Friend's experiments, however, to prove that rust does not act as an oxygen carrier may not be entirely conclusive. None of the experiments precisely correspond to rusting in air and in water. The results reported in Series 4 Experiments suggest that in some cases rust may act as a depolarizer and hence as an oxygen carrier.

Under condition 2, in which the plates were submerged in water, not agitated by air and taken out and dried semi-weekly, a layer of Fe_3O_4 formed next to the metal. This ferrosoferric oxide might have been formed by the reducing action of nascent hydrogen on Fe_2O_3 or by the combination of ferrous oxide (FeO) with ferric oxide Fe_2O_3). Ferrosoferric oxide was also formed under other conditions.

Friend points out that the action of rust when iron is corroding in air and submerged in water may be different.

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[2]Corrosion of Iron and Steel, pp. 96-98, 252-253.

[3]Dammer, Handbuch der anorganischen Chemie, 1898, III, 303.

In the latter case it acts as an accelerator on account of its electro-negative character.

Mill Scale vs. Ferric Oxide as an Accelerator.

Mill scale as a rule causes deeper pitting than rust, although ferric oxide, Fe_2O_3, on account of its higher degree of oxidation, should be more electro-negative than Fe_3O_4. The question naturally arises, therefore, why does mill scale under ordinary circumstances act as a more powerful accelerator of corrosion? The answer is probably to be found in the different physical properties of the two substances as they usually occur. Ferric oxide is formed by dehydration of flocculent ferric hydroxide, and is never as dense or as closely adherent as mill scale. The latter not only adheres closely but is very dense as usually formed by heat on the surface of iron, and in addition is an excellent conductor. It is very difficult to obtain Fe_2O_3 of the same relative density and adhering to the surface in the same way as mill scale, and it would be quite impossible to attain equal conductivity in the two substances.

Corrosion of "Busy Iron."

Engineers are unanimous in the belief that iron or steel in active service does not tend to corrode to the extent that idle iron or steel does; that the steel rail which carries many trains daily will outlast the rail carrying no trains; that the used hammer or other tool rusts less than the unused. The universal testimony of all observers indicates that their belief is well founded.

It may well be questioned whether there is anything intrinsical in use itself as affecting the metal physically, chemically or electrically, which would modify its corrodibility. The observed results are most likely due to surface changes induced by effects of service and may be explained usually by one or more of the following consequences of continued use.

1. The polishing effect of hammering or rubbing which, like all polishing actions, produces a surface which resists corrosion.

2. The shaking or rubbing off of all but tightly adherent rust which in the end forms a protective layer.

3. The accidental coating of the surface of the used iron or steel with oil or oily substances during use which also prevents corrosion.

Cushman has suggested that continued vibration of iron or steel has the effect of equalizing potential differences and Friend believes that in the case of "busy rails" the passage of trains keeps them above the temperature of their surroundings and tends to prevent the condensation of moisture on their surfaces. Sang has suggested that "vibration causes a shedding of the rust, as soon as it is formed on the spots that are not protected by mill scale, and there is, therefore, no acceleration of the action due to the accumulation of spongy and electro-negative rust." Sang's explanation of one of the effects of vibration is undoubtedly correct as far as it goes, and Friend's idea also is undoubtedly true, but none of these explanations go to the bottom of the matter. There is no doubt that busy iron as a rule continuously remains drier, under the same conditions of exposure, than idle iron, due to the cause which Friend has indicated in the case of rails, to vibration and in general to the conditions of use.

The used rail or old tool generally presents two surfaces: one, a polished surface, as the head of a hammer or the top of a rail, the other a dull surface covered with brownish black closely adherent rust, as the sides of a hammer or rail. The polished surface is naturally resistant to corrosion and the tightly adherent rust protects the iron under it. That neither type of surface rusts easily is a matter of common observation. Where these two types of surface join, there is, however, the likelihood of corrosion starting whenever suitable conditions arise, as when the iron or steel becomes idle.

When a railway rail remains idle for several hours during a rain the bright upper surface invariably becomes covered with rust, but if trains are passing at frequent intervals the rust either is not formed at all or is quickly removed.

No more than a mere mention of oil on used iron is necessary. Casual reflection will indicate to anyone that the used tool or machine (or even the steel rail) when there is no intention of oiling it, is more likely to have oil dropped upon it accidentally than the unused.

Perhaps a more correct statement than the usual one of the case of "busy iron" would be to say that (in the absence of oil protection) "busy iron" is protected on certain surfaces by polishing action, but that on surfaces where it does corrode, it corrodes in a self-protective manner.

After the preliminary experiments of Series 1, Series 2 and Series 3 had been concluded it was thought that in view of the partial or the inconclusive nature of the evidence which they afforded that it would be best to start another series of experiments on a number of different varieties of iron which could be allowed to continue under the different conditions for a long period of time. It was hoped from the evidence which such a series would produce that some explanation might be forthcoming as to the reason for the difference between corrosion in acids, in water and under various conditions of service. Series 4 Experiments were the result.[4]

Kinds of Iron Used in Series 4 Experiments.

The varieties of iron and steel made use of in these experiments included the nearly pure iron developed during recent years and manufactured by the open hearth process; ordinary open-hearth iron or mild steel; ordinary Bessemer mild steel; genuine puddled iron; charcoal iron; open-hearth iron containing a small amount of copper; grey cast iron; malleable iron; white cast iron; cast semi-steel and cast steel. All the samples measured 6 inches square, practically equivalent to 15 centimeters square. The rolled sheets were bought for No. 16 iron but some were a little light. The cast pieces were ⅛-inch thick. The amount of surface exposed in the cast pieces, therefore, was slightly greater than in the case of the rolled sheets, but in the tables this slight difference in the area has not been taken into account, as it would have to be if all the figures were reduced to loss of weight from a unit surface, say 1 square inch. Samples of iron of the same kind from two different manufacturers were used in nearly every case. The exceptions were charcoal iron and Duriron, of which one sample only was secured. Twenty-four plates, 6 x 6 inches of each kind, were used.

All of the plates experimented on were used in their original condition with their surfaces untreated. Naturally they were all covered with mill or foundry scale, except the cold-rolled sheets of pure open-hearth iron. The cast metals presumably had the usual cast-metal surface which, as has been pointed out by others, may con-

[4] I wish to acknowledge especially the assistance of Messrs. J. DeRose, O. T. Bloom and L. S. Paddock in carrying out the experiments.

tain a comparatively high proportion of silicon, and thus be more resistant to corrosion than similar metals which have been machined to remove the outer surface, but a reasonable doubt seems justified that this influence amounts to much. The influence of surface, however, should be taken into account in all cases, although it will be seen from an inspection of the results obtained with cold-rolled pure open-hearth iron as against the results obtained with similar metal rolled hot and covered with mill scale that the course of corrosion may be much alike under like conditions even when different surfaces are involved. The most noteworthy difference in the two cases is that the cold-rolled metals subjected to the action of water agitated with air and dried semi-weekly showed a tendency for the rust to adhere more strongly than did the black iron.

The reason for not surfacing the plates was to ascertain the course of corrosion in the case of commercial metals with their ordinary finishes, unmachined, and also unprotected by paint or other coating.

All of the plates were subjected to eight different conditions:

1. Distilled water at rest.
2. Distilled water at rest, plates dried semi-weekly.
3. Distilled water with air agitation.
4. Distilled water with air agitation, plates dried semi-weekly.
5. 10 per cent. salt brine at rest.
6. 10 per cent. salt brine at rest, plates dried semi-weekly.
7. 10 per cent. salt brine with air agitation.
8. 10 per cent. salt brine with air agitation, plates dried semi-weekly.

One set of plates was allowed to remain submerged at all times, while another set was removed from the water or brine and allowed to dry in the air semi-weekly, that is, the latter plates were hung in the air from morning until night on the days in question and then resubmerged. In all experiments three plates were used, but it should be recorded that the difference in appearance between plates from the same experiment and also the differences in weights at different periods was very slight.

All of the No. 4 experiments were carried out in the ordinary diffused light of the chemical laboratory and at ordinary room temperatures, which for the most part ranged between 68 and 72° F., but might go occasionally to 90° F. in summer. The plates were suspended from wooden rods by means of strings attached through a single ⅛-inch hole drilled near the upper edge of the plate. Six plates were hung from each wooden rod, and 12 plates thus attached were placed in each of several earthenware jars measuring 15 inches in diameter and 10 inches deep inside. The plates were kept submerged and water was added from time to time to replace evaporation losses. Whenever necessary the jars were emptied for the removal of flocculent rust, and the plates replaced as promptly as possible in fresh water or brine. The air used for agitation came from the laboratory compressed air system (from a compressor), and no special means were used for washing it. The air was conducted to the bottom of the jars by means of a single glass tube, and a moderately rapid stream of bubbles was kept passing through the liquid day and night sufficient to agitate it slightly and keep it saturated. The agitation caused by the air may or may not have been an important factor in increasing the corrosion. Undoubtedly it did increase it to a certain extent, since it is well known that movement of the corroding plate or the solution is an important factor in corrosion, but how much increase of corrosion would be due to this factor must remain problematical.

Prior to weighing them the plates were cleaned with an ordinary scrubbing brush, which was sufficient for the removal of any flocculent or loosely adherent rust, but which did not remove rust adhering tightly to the metal surface. At the conclusion of the experiments (1,000 days) the plates were weighed after this method of cleaning, again after being cleaned with a stiff wire brush, and the cast-metal plates, which were coated with a strongly adherent layer of rust and the water-at-rest-and-dried series coated with magnetic oxide, a third time after sand-blasting.

Before sand-blasting was used as a means of cleaning the adherent rust and scales from the plates, careful experiments were made as to the conditions under which this removal could be brought about without actually taking off any appreciable amounts of the metal itself. Conditions were ultimately established which resulted in the removal of all the scale without the removal of enough of the metal beneath to affect the results. Prior to the adoption of sand-blasting as a means of cleaning the plates, various other means were attempted but without success. One method was partially successful, namely, dipping the plates first in fatty acids heated to the smoking point, followed by a rinse of hot water and immersion into boiling, strong caustic soda solution. This treatment removed rust and scale in some cases, but was not by any means certain in its action. Hydrochloric acid and antimony trichloride in various proportions were also tried, but this means did not prove effective. Then the sand-blast was applied.

All the experiments were continued for 1,000 days, with the exception of those plates which disintegrated and fell apart prior to that time. The charcoal iron plates corroded so rapidly that they were not experimented with beyond 500 days.

After the cast plates were sand-blasted the surface was ground off by means of an emery wheel, thus reducing the thickness of the plates somewhat and removing the silicon surface, if any. These plates were then replaced in water and brine and subjected to the same conditions as before. These experiments are now in progress. When completed this series of experiments will furnish a comparison between the course of corrosion in the case of untreated cast-iron surfaces and cast iron with the original silicon surface removed.

Appearance of the Series 4 Plates.

After the Series 4 plates were removed from the corrosion experiments at 1,000 days (500 days in the case of Charcoal Iron), their appearance was carefully observed. The detailed description of the plates is omitted in order to save space.

A certain uniformity in appearance prevailed in the case of all plates exposed to the same conditions of corrosion. For example, all of the plates under condition 1, water at rest, not dried, had a clean surface without mill scale or adherent rust. The same was true for condition 5, brine at rest, not dried. Under condition 3, water with air agitation, not dried, generally the surfaces remained clean. In

some instances mill scale remained to the last and there was a strong tendency toward pitting, especially where mill scale had adhered or rust attached itself more firmly than usual. Condition 7, brine with air agitation, not dried, also preserved the surfaces clean, as a rule, and likewise showed a tendency toward pitting. Condition 2, water at rest, dried, left the surfaces covered with tightly adherent magnetic oxide of iron, which in some instances produced fine pitting. Condition 6, brine at rest, dried, did not produce the magnetic oxide surface on the rolled metals, but, on the other hand, the rolled plates under this condition were partly clean and partly covered with reddish brown rust. In some cases the surfaces were nearly clean and in numerous cases, especially among the cast metals, there was pitting action. Under condition 4, water with air agitation, dried, the plates were, as a rule, badly attacked. Some of the rolled sheets were corroded away entirely and the cast metals were frequently deeply pitted. In many cases deep pits and holes prevailed. Condition 8, brine with air agitation, dried, on the whole, perhaps, caused greatest corrosion in the majority of cases, although condition 3, water with air agitation, not dried, also produced great losses. In the latter case (water with air agitation not dried) a clean surface was generally maintained throughout, as noted above, while the oxygen acted as a depolarizer. In the case of condition 8, brine with air agitation, dried, while adherent rust formed during the drying operation, this was lifted in some cases and removed by the brine, or perhaps it did not adhere closely enough to the metal to afford protection. At any rate, the behavior of the adherent rust was decidedly irregular under this condition on the different samples.

Consideration of the Data of Series 4 Experiments.

In considering the data of Series 4 Experiments, it should be emphasized that each result represents an average derived from three plates under each condition of the experiments and that each of the three plates revealed the same course of corrosion by appearance and quantitatively by loss of weight. There was no great difference either in the appearance of any of the three plates or their weights. Therefore, whatever it was in the conditions to which the plates were subjected, surface conditions, composition or physical treatment which produced the final results, these results were uniformly produced in all cases. There was nothing erratic in the behavior of the individual plates. Whatever the causes contributing to corrosion in the various instances, it is evident that definite causes produce definite effects without any great variation in the final results or erratic behavior of individual samples.

Consideration of the Result of Series 4 Experiments from the Standpoint of the Conditions to Which the Various Plates Were Subjected.

The appearance of the plates under the various conditions was determined, generally speaking, by the conditions rather than by the kind of metal. While the experiments were in progress those under a given set of conditions appeared more alike, judging by the appearance of the surface, than unlike as they were known to be on the basis of composition. Certain corresponding sets in water and brine respectively also resembled each other. For example, the appearance of plates under condition 1 and Condition 5 was very much alike, both showing fairly smooth, clean surfaces without pits. Other corresponding sets, although showing certain resemblances, still differed markedly as, for example, plates under conditions 3 and 7, water and brine respectively with air agitation. The plates in water for the most part showed pronounced evidence of pitting, while those in brine did not. The deepest pitting was caused by local areas of strongly adhering mill scale in the presence of air, and the next deepest by adherent rust in the presence of air.

All of the plates subjected to condition 2, water at rest, the plates being dried, become covered after a time with a coating of magnetic oxide of iron, Fe_3O_4, which in some cases could not be brushed or scraped off, and finally required sand-blasting for removal. The usual appearance of this coating was fairly smooth but dull and lustreless. This was true of all of the rolled sheets, but among the cast metals were some in which this black layer did not adhere very strongly, and this non-adherence resulted in its being lifted into small pimples at different points on the surface. In other cases the pimples broke or the black oxide was removed, exposing the metal beneath, which then became covered with the usual reddish rust, and these same plates presented a mottled appearance, part black and part red. In still others the black oxide was removed altogether from time to time or did not adhere very strongly, and these plates were covered with the ordinary red products of corrosion.

These and other details are discussed under the various headings below, and are mentioned in this place merely to emphasize the fact that the conditions under which corrosion takes place dominated over composition in determining the course of corrosion in the common varieties of iron and steel, and that the influence of composition usually makes itself felt indirectly by its effect on, or relationship, to the products of corrosion.

Condition 1—Corrosion in Water at Rest, Plates Not Dried.

In the case of a typical sample of rolled sheet metal covered with mill scale, corrosion starts wherever the mill scale is abraded, loosely adherent or porous. The corroding areas gradually enlarge, and the mill scale is correspondingly reduced in area until it is finally removed. This leaves a rather smooth, finely crystalline surface, and this surface is maintained throughout the experiment. Corrosion as measured by loss of weight proceeds at a very regular rate, the plotted losses producing nearly straight lines without appreciable irregularities. So far as oxygen is concerned in corrosion of this sort, it must enter the water by the slow process of diffusion and solution from the air. The rust formed is loose and flocculent, and if at all adherent, easily removed by a soft brush. The losses in weight are, with one exception, greater than in the case of 10 per cent. brine without air agitation and without drying. The single exception to this general rule was furnished by one of the samples of open-hearth pure iron, in which case the samples in brine lost slightly more weight than those in water. The corrosion in this instance shows a break between 400 and 500 days, as though scale had formed and fallen off. This is the only instance of such an irregularity in any sample, and, whatever the cause, undoubtedly accounts for the results.

The cast metals behaved very much like the rolled metals, but it is noticeable that on the average the losses from the cast metals were greater than in the case of the rolled metals. There is one exception to be noted, namely, the two samples of puddled iron, which showed

higher losses than any other rolled metal and also higher than any of the cast metals. It would appear from these results that when the ordinary types of iron and steel corrode under water at rest that the corrosion follows in general what would be expected from the electrolytic theory on the basis of composition apart from any marked influence by rust, and that the more impure metals corrode most. Even this generalization, however, fails to hold good in particular cases. Thus, while the average loss from the cast metals at 1,000 days is 29.4 grams, and the average of the rolled metals, with the exception of the puddled iron, 24.6 grams, two samples of open hearth pure iron show greater losses than the average, whereas from their purity one might expect that they should show the least loss of all. Impurity is a general term, much too general, apparently, for the present discussion. Of the cast samples investigated the grey cast-iron and the semi-steels contain more impurities than any others, these impurities being principally graphitic carbon and silicion. The impurities in the grey cast-iron are greater than in the samples of semi-steel, but the rate of corrosion is very nearly the same. One of the malleable irons is high in graphitic carbon and the other low. The one which is high in graphitic carbon shows a higher rate of corrosion than the one which is low in graphitic carbon.

Above all it should be emphasized that the most important distinction between this series of tests and the others is the absence of adhering rust.

Condition 5—Corrosion in Brine at Rest, Plates not Dried.

Two principal points should be noted under condition 5, distinguishing the course of corrosion in brine at rest from that in water at rest. First, that with one exception the corrosion was less in brine than in water, and second, that adherent rust made its first appearance here, although in the case of the cast steel samples only. It has been commonly supposed that brine and other electrolytes were necessarily accelerators of corrosion and there is evidence to support this view, particularly under atmospheric conditions when alternate wetting and drying occurs. At any rate this view has become current in spite of the demonstration of the contrary fact by Heyn and Bauer and Friend and Brown under such conditions that the iron was submerged in solutions of various strength, the only access of air being through the liquid surface.

In brine, puddled iron does not show the highest corrosion, as it did in water, but, strange to say, open-hearth pure iron does—that is, if we except the sample of charcoal iron which was continued for 500 days only and cannot be compared directly with the other samples.

In considering corrosion under condition 1, and even more under condition 5, one is constantly reminded of the corrosion which takes place when iron dissolves in acids. The appearance of the plates is similar, that is, the surface is moderately smooth and the crystalline structure is in evidence. The pitting tendency is at a minimum. When metals dissolve in acids the liquid becomes saturated with hydrogen, whereas under conditions 1 and 5, the liquids contain more or less atmospheric oxygen.

Condition 3.—Corrosion in Water With Air Agitation, Plates Not Dried.

The enormously increased corrosion which occurs on submerged plates when the liquid is kept saturated with air was prominently shown. Generally speaking, the results are less regular than in conditions 1 and 5, and are strongly suggestive of several influences at work leading to different final results in different cases. It might almost be concluded that the final results are to be considered as a compromise between different factors or a resultant of various forces acting in some cases in contrary directions. This will also be found to be true under the more drastic conditions of corrosion considered subsequently.

The cast plates also showed pitting, but another prominent characteristic of these was the development of pimples, cones and craters on the surface. The formation of pimples was due to the separation of a film of oxide from the surface of the metal, presumably by gas. Underneath such a pimple a pit was formed. The cones and craters were formed in the usual manner by the movement of rust with the electrolytic currents as described by Cushman and Gardner.[5]

In general, the rolled metals show a more uniformly large amount of corrosion than do the cast metals. However, the two cast-steel samples show the highest amount of corrosion of any. Among the cast metals are some which show the lowest rate of corrosion, and of these one of the grey cast-irons is lowest of all, one of the semi-steels being next.

Obviously composition is not in itself and directly the determining factor here. Oxygen undoubtedly is, but with this fact admitted, more light is needed on the behavior of the various cast metals, since they show such great variations in corrodibility, and also on the reasons for the rather uniform and high rate of corrosion in the rolled metals. The irregularities shown by the various metals under condition 3, and particularly when these results are compared with those obtained under condition 7, next to be considered, offer much data for careful consideration and suggestions for further experiments. The cast-iron and semi-steel samples are the ones which suffered least corrosion, and these metals are both distinguished by a high percentage of graphitic carbon and of silicon.

The failure of the grey cast-irons and the semi-steels to corrode as rapidly as the purer rolled metals or the cast-steels in the presence of oxygen but with rust for the most part absent, opens a wide line of questioning, and tempts one to make hypotheses. Is it possible that we are dealing here with a mild form of passivity such as might be induced by the action of oxygen on the iron surfaces, causing them to become electro-negative to the graphitic carbon? If we suppose the graphitic carbon in the cast metals to be electro-positive to oxides of iron, then possibly the ordinary direction of current under corrosion from iron to iron oxides would be modified, and there would be no corrosion.

To generalize and put the matter in brief form, the purer the metal the greater is the accelerating influence of oxygen and oxidizing agents (provided they do not induce passivity) in corrosion.

Condition 7.—Corrosion in 10 Per Cent. Salt Brine With Air Agitation Plates Not Dried.

Under this condition all types of metal used showed less corrosion than under condition 3, with the exception of the two samples of grey cast-iron and the two samples of semi-steel, which showed greater corrosion under condition 7. However, even in the case of these two types of metal, the pitting action shown by practically all the plates under condition 3 was not in evidence. Generally

[5]Corrosion and Preservation of Iron and Steel, pp. 57-61.

speaking, all of the plates under condition 7 presented a fairly smooth, clean surface, finely crystalline in appearance in the case of the rolled metals and granular in the cast metals. The edges were not serrated, and little mill scale or strongly adherent rust was present. The difference in appearance between plates held under condition 3, compared with those held under condition 7, is striking, much more so than the difference in weights.

Condition 2.—Corrosion in Water at Rest, the Plates Being Dried Semi-weekly.

The characteristic thing about these plates was the tightly adherent coating of black magnetic oxide of iron which formed shortly after the mill scale came off and persisted throughout the experiment.

The cast metals differed from the rolled sheets in showing a tendency in some cases towards the production of reddish or reddish-brown rust instead of the black magnetic oxide layer under condition 2, and, on the other hand, towards the production of the black layer under condition 6. These conditions (2) showed the comparatively small amount of corrosion in water as contrasted with brine, particularly in the case of rolled sheets.

Condition 6.—Corrosion in 10 Per Cent. Salt Brine at Rest, the Plates being Dried Semi-weekly.

The appearance of all of the plates under this condition was decidedly different from that under condition 2. The rolled sheets were not covered with the black oxide coating so characteristic of similar plates held under water and dried semi-weekly. Under condition 6 the rolled metal plates remained partly clean and partly covered with a typical reddish brown rust. Much of the rust could be removed with a soft brush and practically all of it with a wire brush, so that it was not necessary to resort to sand blasting. There was little pitting in any of the rolled sheets, the deepest occurring in the two samples of Puddled Iron. The charcoal iron showed no pitting.

Among the cast metals the most severe action occurred in the case of the two samples of cast steel, and this action was evident to the eye in the form of broad, deep pits and holes. The iron losses were comparable to those of the gray cast irons and semi-steels. The average loss by the cast metals, with the exception of the two cast steels, was much less than the loss sustained by the rolled sheets. The two samples of cast steel lost an average of 189.1 grams, greater than that of any other sample.

The influence of the products of corrosion in causing pitting action and also in producing a protective coating is illustrated among the cast metals. The rust on the two samples of gray cast iron adhered very tightly, as shown by the fact that these plates exhibited no loss in one case and only 2.1 grams in another when scrubbed with a soft brush. Treatment with a wire brush removed a considerable amount of rust and sand blasting a still larger quantity, although the final loss was comparatively low. The same holds true for the two samples of semi-steel.

Condition 4.—Corrosion in water With Air Agitation, the Plates Being Dried Semi-Weekly.

This condition, and the succeeding one, No. 8, in which brine is substituted for water, were the most drastic of all utilized in Series 4 Experiments. As a consequence the losses were higher than under the conditions previously considered. All samples were more or less covered with reddish-brown rust. In some cases this was tightly adherent in spots. In others it was spongy. The rolled metals under condition 4 were much more severely attacked as a whole than the cast metals, the only cast metals approaching them in pitting effect and general corrosion being the two samples of cast steel.

Of the cast metals, all but the two cast steels held up in a remarkable manner throughout the test, although all showed evidence of pitting action. The two best in appearance were the two grey cast-irons with the two semi-steels running a close second. The white irons and the malleable irons were about alike in appearance, although the malleable samples lost more than the white irons. The two cast-steel samples lost more than any other of the cast metals, but less than most of the rolled sheets. They were, however, badly pitted, and showed every evidence of the worst sort of corrosion such as results in early failure.

Condition 8.—Corrosion in 10 Per Cent. Salt Brine With Air Agitation, the Plates Being Dried Semi-Weekly.

Judging by the appearance of the plates and the losses, this was the severest condition of all. As in condition 4, all plates were covered with reddish-brown rust, which showed different degrees of adhesion in the case of different samples. Speaking of all the plates, the chief difference perhaps between those from condition 8 and condition 4 was the larger pits and holes produced in condition 8.

It is a most difficult matter to draw any conclusions from these experiments which correlate composition and corrosion. Gross mechanical and physical differences undoubtedly invite corrosion, as can be seen by inspection of the cast metals, but on the other hand, extreme purity and uniformity (in the sheet metals) do not protect against corrosion. The less pure metals, on the whole, resisted corrosion under condition 8 better than the purer, the best samples being in order the white cast-irons (average loss, 151 grams), the semi-steels (average loss, 191 grams), and the grey cast-irons (average loss, 196 grams. Malleable iron, with the lower carbon content, lost much more (237 grams) than that with the higher carbon content (192 grams). This is what would be expected from a comparison of the cast and rolled metals in respect to carbon content.

Summary.

1. When any of the ordinary varieties of iron or steel corrode under ordinary conditions, oxygen determines the commencement of the corrosion.

2. External conditions overbalance composition in most cases in determining the course of corrosion.

3. The role of oxygen appears to be that of a depolarizer since it combines not only with hydrogen at the corrosion cathodes, but also with ferrous iron at the corrosion anodes.

4. The role of carbon dioxide is a minor one in the corrosion of iron, under ordinary conditions.

5. Rust plays several important roles, accelerating corrosion by acting as a cathode and probably as a depolarizer, and in other cases where it adheres strongly it acts as a protector. It is a frequent cause of deep pitting.

6. Mill scale, when it adheres tightly and uniformly, may protect iron and steel against corrosion for a time at least, but where it adheres locally in patches it is a cause of deep pitting.

7. In the absence of oxygen, corrosion commences, but soon stops or drops to a negligible rate.

8. In salt solutions corrosion follows a course depending

principally on the amount of oxygen in solution, secondly, on the influence of the salt solution.

9. Oxygen causes much more rapid corrosion than air, but may produce a protective layer of rust not produced in air, thus reducing corrosion below that in air under similar conditions.

10. Corrosion of 12 common varieties of iron and steel carried out under 8 different conditions for 1,000 days is described and tabulated in detail. It is difficult to summarize this data and reference should be had to the text.

13. Pure iron corrodes relatively slowly under non-oxidizing conditions or with limited access of oxygen and relatively rapidly in the presence of oxygen or air.

14. Whereas cast iron corrodes relatively more in the absence of air or oxygen, or with limited supply, and relatively less in the presence of air or oxygen compared with the purer irons.

15. The production of an iron which will resist corrosion because of its purity is impossible of attainment. Such an iron would resist corrosion fairly well if submerged and in situations which allow but limited supply of oxygen. However, under ordinary conditions oxygen (air) is present and pure irons in the presence of air corrode with extreme rapidity.

16. In many cases rust acts as a protector of iron in exposed situations, but the correlation between rust-adhesion and composition is not yet sufficiently worked out.

17. Generally speaking, rust adheres better to cast iron than to pure rolled iron and hence in exposed situations cast iron withstands corrosion better than purer open hearth or puddled irons.

18. When "busy iron" fails to corrode it is because of: 1. Polished surfaces. 2. Protective rust. 3. Accidental coating of oil.

19. Solution pressure, while fundamental in corrosion phenomena, is not, as a rule, the determining factor.

20. A comparison of the corrosion of aluminium and copper plates with the corrosion of 12 common varieties of iron and steel shows that aluminium (with a high solution pressure) corrodes practically not at all under any of the 8 conditions to which it was subjected; and corrodes not only very much less than iron under the same circumstances, but even less than copper, a semi-noble metal with low solution pressure.

21. For a general theory of corrosion many factors must be taken into consideration, among which solution pressure may be, relatively, a minor one.

NOTE—It should be understood that the above article does not appear in full, but, with the author's approval, only the outlining paragraphs appear. The original paper consisted of a 94-page booklet issued by the American Institute of Chemical Engineers.

GEORGIAN MANGANESE AGAIN SHIPPED TO ENGLAND.

The first shipment of Georgian manganese to arrive in England since the war arrived recently in the American vessel, the Jomar, which had carried out from New York a cargo of flour for the suffering Armenians, shipped by the Near East Relief Association. The manganese was loaded at the Georgian port of Poti, on the Black Sea. The British Government has had a mission in Tiflis and Batoum endeavoring to make arrangements to buy up all the output of the Georgian mines for British steel works, and the shipment on the Jomar was the first.

How Talc is Mined at Madoc, Ontario.

Deposits of talc are known in many districts in Canada, but at the present time active mining operations are reported only in Ontario. Here three companies are now operating, two of which, George H. Gillespie & Co., Ltd., and the Anglo-American Talc Co., are at Madoc. The operations of the former company are probably the largest and best known in Canada. Mr. Raymond B. Ladoo, in his capacity as an engineer of the U.S. Bureau of Mines, was permitted by this company to make an inspection of its mine and mill in June, 1920, and study the methods employed. This information was desired for comparison with methods employed in the United States. The following description is based on observation made during this visit, supplemented by data supplied by the company:

Mining.

The mine and mill of George H. Gillespie & Co. are at Madoc, Hastings County, on the Grand Trunk R. R., in the Province of Ontario, Canada, the mill being situated on a siding opposite the station, and the mine about two miles distant. The mine, known locally as the Henderson Mine, has been operated for a number of years by different companies, but only under the present company has the operation been particularly successful. The early work done was all open-pit mining, but at present all the talc is being removed by underground mining methods from beneath the bottom of the old cut. The ore deposit seems to be of the shape of a flattened inverted canoe, dipping to the south at a steep angle. It is underlain and overlain by crystalline gneisses and schists, and is intimately associated with dolomite, from which the talc was probably derived. The talc is white and crystalline, varying from very soft to medium hard. Dolomite and calcite are common impurities, occasionally feldspar and quartz, and sometimes pyrite.

On each flank of the "canoe" vertical shafts have been sunk in the ore. The east shaft is now being used for hoisting, but a new vertical shaft is being sunk in the foot-wall near the middle of the bow. The present haulage level is at a depth of 200 feet, but the new shaft will be 300 feet deep, and will develop a new level. The vein varies in thickness from 15 feet to 70 feet, with an average of 35 feet. The vein from wall to wall is of good grinding stock, and no waste is made, except in rock development. The workings are 700 to 800 feet long, but it is probable that the vein extends for at least twice this length within the boundaries of the property.

The method of mining now in use does not follow exactly the one that will be used when the new shaft is complete, due to the fact that previous operators developed the mine; but the differences are of minor importance, and the ideal method will be described. From the new shaft a cross cut will be driven to the vein, and six-foot by six-foot drifts run along the foot-wall outlining the ore body. At intervals of about 20 feet along the drift raises are put up, usually on the hanging wall side. After leaving a horizontal pillar to protect the drift the raises are widened out into stopes the full width of the vein. Timbered ore chutes are provided at each raise, and additional man-way raises are cut where needed to give access to the stopes. Only sufficient ore is drawn off from the chutes to keep the broken ore level in the stopes close enough to the ore in place to make drilling easy. Overhand stoping and drawing off ore is con-

tinued upward until a timber mat, which was laid down in the bottom of the open cut above, is encouutered. The stope is then considered finished, and is allowed to remain full of broken ore. When the ore is needed it may be readily drawn off through the chutes, and the drawing continued until surface waste appears. The drift pillars keep the drift open, even after all the ore is drawn and the stopes filled with waste. It is stated that, by this method, when the stopes are full of ores, a production of 100 tons per ten-hour day can be maintained with only five men, four underground and a hoist man at the top.

This method of mining has many advantages. All ore is broken by overhand stoping; many working places are available; few men underground are required, as no shovelling is necessary; no timber is needed in stopes; large storage for broken ore is available at no cost; ore is not liable to be watersoaked, as the stopes drain themselves. The principal disadvantage is that ore may arch or hang up in the chutes, but usually the jam may be broken by shooting with dynamite. This method of mining is well known in metal mines, where it is called "shrinkage stoping." It is excellent for veins of moderate width which have strong, well-defined walls.

From the chutes the ore is drawn off into one-half or two-thirds ton, 18-inch gauge, steel cars, trammed by hand to the shaft and dumped directly into the skip. The shafts are well timbered and divided by lagging into a skipway and a ladderway. Sollars or landing platforms are located every 15 to 20 feet vertically. The drifts require some timber, but in general need no lagging. Drainage is not a great problem, and the water is taken care of by a small three-stage electrically driven centrifugal pump. Most of the drilling is done with small compressed air drills of the jack-hammer type.

At the surface the skips dump automatically into a bin, provided with several loading chutes, from which wagons or trucks are loaded. In the power house are a double-drum hoist, geared to a 15-h.p., 220 volt, A.C. motor and a 10-inch by 12-inch single-stage air compressor, belted to a 40-h.p., 220 volt, A.C. motor. The total installed horsepower at the mine is 70, but the load ordinarily carried is much less. Production is now about 50 tons per eight-hour day, and the capacity under present conditions is about 80 tons. When the new shaft is completed the capacity will be 100 tons per eight-hour day.

Milling.

Ore from the mine is hauled, on contract, a distance of about two miles to the mill. The mill has grown to its present size by successive stages in such a manner that the present arrangement is not ideal, but the efficiency of the milling process is high. This difficulty, common to many mills which have grown with unexpected rapidity, will be eradicated in the new mill which is contemplated.

Ore from the mine is dumped into a small bin, from which it is drawn off and fed by hand into the crusher. The type of dryers used is unusual in talc mills. They are of the Cutler type, made by the Nordyke-Marmon Co., for use originally as corn dryers. Essentially they consist of a bundle of steam-heated pipes set in circular headers, which are revolved mechanically about an axis nearly horizontal. The talc enters at one end, and is cascaded around and between the hot pipes until it reaches the outer end. The drying temperature may be regulated very closely, thus guarding against overheating, and there is no soot or ashes to contaminate the product. It has been found advisable to convey the dried talc for some distance in the open air before being fed to the next machine. This allows the moisture which has been driven out from the pores of the rock to evaporate.

The opinion has often been expressed in the United States that the bolting of talc through silk cloth was obselete due to slowness and excessive cost. This mill demonstrates that bolting can be done efficiently and economically if proper precautions are taken. The secrets of success here seem to be: (1) Careful sizing of the talc before bolting; (2) The utilization of a large number of bolts; (3) No overloading of bolts; (4) Intelligent and careful supervision. Another feature of this mill is the use of short (5 feet by 8 feet) continuous feed and discharge tube mills, instead of the intermittent dump cylinders or the long (6 feet by 24 feet) continuous tube mills used in other parts of the country. Furthermore, the tube mills here are used singly in closed circuit with bolts, instead of three or four in tandem. This close and careful sizing not only produces a very uniform product, but cuts down greatly the power consumption for grinding.

Three grades of ground talc are ordinarily made here, based on color and grain size. The most important consumers are the toilet powder, textile and soap industries. The present mill capacity is about 50 tons per 22-hour day, for the production of which about 140 horsepower is used. The erection of a new mill of 100-ton capacity, but following the present system of milling, is contemplated.

The mine of the Anglo-American Talc Co. is close by that of the George H. Gillespie Co., Ltd., and is said to be on the same vein. No opportunity of visiting the mine and mill of this company was afforded, but it is reported that the system of milling resembles that used in the Gouverneur district of New York State.—From Reports of Investigations, U.S. Bureau of Mines, September, 1920: "Talc Mining and Milling at Madoc, Ontario," by Raymond B. Ladoo.

Personals.

Mr. W. E. Ross, who left the Standard Chemical Company's employ some months ago to take a position with the General Electric Company, has been placed in charge of a section of the latter company's experimental engineering laboratory at Nela Park, Cleveland, O.

Mr. Roy L. Dorrance, formerly with the Division of Chemistry, Central Experimental Farm, Ottawa, has been appointed to the staff of the Department of Chemistry. Queen's University, Kingston, Ont.

Mr. James Moran, formerly of the Fuel-Testing Plant of the Department of Mines, Ottawa, has been transferred to the Mines Branch, Sussex Street, Ottawa.

Mr. R. Sneddon, who for the past four years has been doing analytical work with the Dominion Grain Research Laboratory, Winnipeg, has opened a cereal analytical laboratory in Winnipeg as a private enterprise. Prior to his post with the Dominion Grain Laboratory, Mr. Sneddon was consulting chemist to the Western Canada Flour Mills.

SMALTITE MINING PROVES SUCCESSFUL.

A large number of the Cobalt and South Lorraine properties in the Northern Ontario Mining district have been found to contain large amounts of smaltite, $CoAs_2$ (a cobalt diarsenide). Smaltite, when pure, contains 28.2 per cent. cobalt, and by replacement of the cobalt by nickel, it grades into the nickel arsenide chloanthite $NiAs_2$. Smaltite is selling for 50c an ounce at the mines.

A New Canadian Oil Field.

By G. G. Ommanney, M.E.I.C.,
Investigation Engineer, Canadian Pacific Railway.

In an article prepared by the writer and published in March, 1920, entitled "Canadian Oil Exploitation and Prospects," occurs the following:

"If we examine the geological map of this area (referring to Western and Northwestern Canada), we find that the great oil-bearing strata of the North American continent which have produced the richest and most prolific oil reservoirs of the world constitute the principal geological formations of this vast Canadian territory. It requires, therefore, no more than an average share of optimism to predict that Canada's future as a world oil producer is certain, and only awaits the assured result of capital expended on exploration by the drill."

A Prediction Confirmed.

Since these words were written our prediction has been strengthened in a most striking and important manner. But a few months later a new and highly productive oil field was brought in in the State of Montana, immediately south of the Alberta boundary.

This field now includes two of the largest producing wells in the country—the Frantz and the Decker-Collins, yielding 2,000 and 2,800 barrels a day respectively.

The significance of these discoveries to prospective Canadian fields will be discussed later.

On top of this we can to-day point to further confirmation in the news, just received and confirmed, of an important oil strike in the Canadian Northwest at the Imperial Oil Company's well, Fort Norman, lat. 65 degrees, long. 126 degrees, on the Mackenzie River. The oil at this latest discovery is reported as flowing through a six-inch casing, and the yield (unconfirmed) as over one thousand barrels a day. The well has been capped.

Oil Fields North and South of Alberta.

Thus we have to-day actually proven oil fields at the northern and southern extremities of the great settled region of Alberta now served by transportation.

What are the prospects of oil in this region? They are almost removed from the sphere of prediction to that of certainty.

Geologists and oilmen have long recognized and agreed upon the similarity of the Wyoming and Montana formations with those of Alberta. With the bringing in of the Montana gushers referred to above, oil has now been proved from Wyoming almost up to the international boundary. The oil in these two great producing Montana wells undoubtedly originated from the Devonian formations which extend throughout the whole of the vast Canadian territory to the north up to the newly proven field in the far Northwest.

Evidence of Gas Fields.

The problem resolves itself into locating the structures favorable for trapping the oil, and much work has and is being done to this end. Every producing gas field is in itself a potential oil field, and, as further evidence, the discovery of the great Albertan gas-yielding fields (such as the Medicine Hat) have been followed by similar discoveries within thirty miles of the international boundary at Havre, Montana, producing from precisely the same sandstones as at Medicine Hat.

The small producing oil field at Dingman, southwest of Calgary, where the contortion of strata by the mountain uplift has greatly limited the area of producing fields; the vast bituminous seepages, known as the Athabaska tar sands, further north at Fort McMurray; the numerous gas wells developed throughout the country, extending 300 miles east of the Rockies and 700 miles north from the international boundary, are all contributing evidence.

This evidence in recent years has attracted the attention of the biggest oil interests in the world.

Extensive Drilling Operations.

As a result we have at September of this year a list of twenty-four locations where drilling is actually in progress throughout Western Canada, not including eight in the Coastal district.

That Canada will, in the comparatively near future, become an important contributor to the world's oil supply is, we therefore contend, a foregone conclusion.

TREATMENT OF THE EYE AFTER EXPOSURE TO ULTRA-VIOLET RAYS.

According to Dr. C. R. Kindall, Bureau of Mines, Washington, D.C., a case is reported where 17 out of 20 men viewing a demonstration in arc-welding were affected by ultra-violet rays. Two were protected by orange-colored glasses, thick-lensed, and were not injured. Others with thin lenses were affected by long exposure. In some cases the pain was sufficiently severe to warrant morphine. The treatment is to place ice packs on the eyes three or four times daily. If there is a discharge, a few drops of 25% solution of argyrol or 50% solution of protargol should be placed in the eyes three to six times daily. The eye should be irrigated with normal salt solution or saturated boric acid. Wherever arc-welding outfits are used, the lenses, which are made up of alternate layers of red and blue glass, should be thick enough to protect always from ultra-violet rays.

OBITUARY

Ernest G. Henderson.

It was with keen regret that his many business associates throughout Canada learned of the death of Mr. Ernest G. Henderson, president and general manager of the Canadian Salt Company, Windsor, Ont., who passed away at the Royal Victoria Hospital, Montreal, October 13th, after an illness of over three months, which terminated in pneumonia. Mr. Henderson had been removed from his home in Windsor three weeks before his death to undergo an operation, which, owing to his condition, was not performed. Mr. Henderson was one of Windsor's best-known citizens, and had served as President of the Board of Trade, Chairman of the Board of Education, and President of the Windsor Branch of the Children's Aid Society. He was in his 64th year, and came to Windsor in 1896 as President of the Canadian Salt Co. when that company established its plant at Windsor. The esteem in which he was held by business men throughout Canada may be judged by his having been made President of the Canadian Manufacturers' Association, a position which he discharged with great ability during his term in that office. During the war he took an active interest in all patriotic work, and gave his only two sons to the cause, and their death in France was a severe blow from which he never recovered. In politics he was a staunch Conservative and he took an active interest in political movements, though never being narrow in his views. He was a devoted member of the Anglican Church, a loyal worker therein, and for many years represented his church as lay delegate to the Synod. In all things he was very progressive, and stood always for the best interests of his community. He is survived by his wife and two daughters, Mrs. (Rev.) F. A. P. Chadwick, Vancouver, and Miss Henderson, Windsor.

Report of Proceedings

International Conference of Chemistry, Rome Italy, June 22-24, 1920

THE First International Conference of Chemistry met at Rome from June 22nd to 24th, 1920, under the presidency of Prof. Charles Moureu, member of the Institute of France.

The order of the day of the Conference comprised the reunion of the Council of the International Union of Pure and Applied Chemistry, composed of the representatives of the five nations that founded it, viz.: Belgium, the United States, France, Great Britain and Italy.

The Council had to consider the admission to the Union of seven other nations, viz.: Canada, Denmark, Spain, Greece, the Netherlands, Poland and Zecho-Slavia, all of which were unanimously admitted.

The General Assembly was then called to order. It comprised the following delegates:

BELGIUM.—M. Rene Lucion, Doctor of Science, former president of the "Societe Chimique de Belgique," head of the Laboratory of "La Societe Solvay."

M. Frederic Swarts, Prof. at Grand University, and member of the "Academic Royale de Belgique."

DENMARK.—M. Einar Billman, Prof. of Chemistry at the University of Copenhagen, President of the "Danske Kemiske Foreningers Faellesraad for Internationalt Samarbejde."

M. Warming, Chief Engineer of "A/S Dansk Svovlsyre og Superphostfabrik."

UNITED STATES.—Mr. Charles L. Parsons, Docteur of Science and Doctor of Chemistry, General Secretary of the American Chemical Society.

FRANCE.—M. G. Bertrand, President of the "Societe Chimique de France," Prof. of the Faculty of Science at Paris, and Head of Service of the "Pasteur Institute."
M. F. Bordas, Substitute Professor at the College de France, Director of the Laboratories of the Minister of Finance.

M. Jean Gerard, Chemical Engineer, General Secretary of the International Union of Chemistry, and of the "Federation Nationale des Associations de Chimie de France."

M. Paul Kestner, President of the "Societe de Chimie Industrielle."

M. L. Lindet, Member of the Institute, Member of the "Accademia Nazionale de Lincei," President of the "Association des Chimistes de Sucrerie et de Distillerie," Professor at the "Institut Agronomique."

M. Ch. Lormand, Chemist in the Laboratory of the Minister of Agriculture, Member of the executive committee of "Chimie et Industrie."

M. Camille Matignon, Vice President of the "Societe de Chimie Industrielle, Prof. at the College of France.
M. Ch. Marie, General Secretary of the "Societe de Chimie Physique," and of the Commission Internationale des Tables de Constantes.

M. Charles Moureu, President of the International Union of Chemistry and of the "Federation Nationale des Associations de Chimie," Prof. at the College of France.
Mr. Nicolardot, "Examiner for the Admissien," and tutor at Polytechnic School.

GREAT BRITAIN.—Sir William Pope, President of the British Federal Council for Pure and Applied Chemistry and of the Society of Chemical Industry, Prof. at Cambridge University.

Mr. Hay, Chemical Engineer, Technical Delegate to the Commission on Reparations.

GREECE.—Mr. Zenghelis, Prof. at the University of Athens.

ITALY.—Mr. G. Bruni, Prof. at the "Milan Polytechnic."
Mr. C. Ciamician, Senator, Prof. at the University of Bologne, President of the "Associazione Italiana di Chimica generale ed applicata."
Mr. F. Garelli, Prof. of "Turin Polytechnic."
Mr. R. Nasini, Prof. of the University of Pisa, Member of the chief council of Public Instruction.
Mr. L. Parodi-Delfino, Engineer, Vice President of the "Associazione Italiana di Chimica Generale ed applicata."
Mr. G. Oddo, Prof. at University of Palermo."
Mr. Plancher, Prof. at Univesity of Parme.
Mr. E. Paterno, Senator, President of "Consiglio Nazionale di Chimica," Prof. of the University of Rome, Member of the "Accademia Nazionale die Lincei," Member of the Superior Council of Public Health.
Mr. F. Quartier, Engineer, Administrator of the "Societa Italiana Prodotti Esplodenti."
Mr. A. Peratoner, Prof. at the University of Rome.

NETHERLANDS.—Mr. R. H. Kruyt, Prof. of Physical Chemistry at the University of Utrecht, President of the "Nederlandsche Chemische Vereeniging."

POLAND.—Mr. Kowalski, Prof. at the Polytechnic School of Varsovie, Polish Minister to the Holy-See.

ZECHO-SLAVIA.—Mr. E. Votocek, Prof. of both Mineral and Organic Chemistry at the Polytechnical School of Prague, President of the "Societe Chimique de Boheme."

All the meetings were held at the "Accademia dei Lincei," in the Corsini Palace, one of the most beautiful palaces of Rome.

Each one of the meetings was presided over in turn by a member of the different delegations.

The questions inscribed on the order of the day were those that had been the object of previous reports which were submitted to the delegates. Committees which had been appointed to examine these reports submitted their conclusion to the General Assembly, which accepted them unanimously.

The plan of organization and the rules governing the International Union of Pure and Applied Chemistry, of which Mr. Gérard was the recording secretary, were dealt with, and the organization of the Union was arranged as follows:

In order to belong to the International Union of Pure and Applied Chemistry, a country should establish, in the first place, a tie between the different chemical societies in the country itself, either by the formation of a National Council composed of the representatives of the different societies, or by a Federation of those same societies. The initiative in the formation of this National Council or Federation may be taken by any chemical society, or by the National Academy, or by the National Council of Research, or by any similar national institution, or by the Government.

By the terms of the statutes the Union is governed by a Council made up of the delegates of each of the countries belonging to the Union. The executive power of the Council is vested in one office. The power of the General Assembly is absolute. The General Assembly receives reports on the actions of the Council, on the financial situation and general condition of the Union; it approves the accounts of the closed meetings, votes the budget for the following meeting, and deliberates on the questions inscribed in the order of the day. A special office assures the permanent relation of the chemical organizations of the different countries belonging to the Union. The rules of this office governs its actions.

Placed under the control of the Council of the Union and the direction of a committee, this special office is charged with the execution of the program drawn up by the Council and defined by the office. This permanent office bears the name of the "International Office of Chemistry," and has its place of business at the head office of the Union; it is, in a word, the pivot of all the organizations attached to the Union.

The Council of the Union can establish, along with this office, permanent committees to study certain questions. undertake certain work which has been decided upon, or manage the international organizations capable of being created; finally, a Consulting Committee, divided into sec-

tions corresponding with the different scientific and industrial branches of the Union; this committee to be made up so that its members will represent every branch of pure and applied chemistry. It will examine in every detail the questions included in the program. The associated nations are represented in each section by delegates, which name for three years the official body belonging to the Union. The reunion of the delegates of a nation as a Consulting Committee forms a National Committee. The National Committees have as their object the study, in their respective territories, of all questions bearing on chemistry from the point of view of the developments of knowledge in the scientific, industrial or economical world.

A meeting of the Council of the permanent Committees, of the Consulting Committee and of the General Assembly shall be held each year under the name of the International Conference of Chemistry.

The adoption by the Conference at Rome of the report submitted by Prof. Lindet, in the name of the "Fédération National des Associations de Chèmie de France," asking that the International Conferences be attached to the Union, took up a whole chapter of the ruling dealing with this question.

The elaborate text provides that the Union shall organize every four years an "International Congress of Pure and Applied Chemistry." This Congress may be divided in sections corresponding to the consulting committees of the Union, for the purpose of studying and discussing reports and communications.

The usual language of the Conference shall be English, French and Italian. Communications may be made in any other language, provided that the person making them can give or have someone else give a translation, or a resume, in one of the usual languages. In order to avoid errors of interpretation, the votes, resolutions and official acts, if they are not originally rendered in French, should be translated into that language.

The Office of the Union at the beginning of each Congress shall present a general report of the resolutions adopted by the preceding Congress, with the results of the same. It is easy to understand by this analysis of the statutes and rules of the Union that its organization, which is particularly simple, renders it capable of undertaking the most widespread endeavors and to effectually contribute to the development of science and industry.

Furthermore, to encourage research, the Council of the Union may, within the limits of the funds allotted to it each year by the General Assembly, grant medals and prizes to the authors of such works which it may deem to be worthy of such destinction.

Passing on to the discussion of Mr. Nicolardot's report on the unification of chemical analyses, the Conference passed the resolution that the International Conventions signed at Paris, October 16, 1912, for the unification and presentation of the results and analysis of the materials destined for the alimentation of man and animals, and that a permanent International Bureau of Analytical Chemistry be established at Paris for the purpose of studying these materials, the Conference asked that this resolution be ratified and put into force as soon as possible by the nations belonging to the Union.

Following the report presented by Mr. Crismer for the formation of an International Institute of Chemical Standards, the Conference delegated the Council of the Union to organize a Bureau of Standards, divided into three sections: Chemical Standards, Pure Products for Research Work, and Technological Products.

The Office of the International Union will serve as an organization connecting the Scholar, the Manufacturer and the Trader on the one side, and on the other to encourage the exchange of ideas and the sending of products to the interested parties by the scholars, manufacturers and traders.

The United States, with their particular organization, shall form a branch, bound to the Union by the same title as the other sections already formed.

The different sections will be charged with the execution of the conditions fixed by the lenders or donors. The three sections shall be organized as follows: The first by Belgium, the second by Great Britain, and the third by France.

In consideration of the importance of the Thermo-Chemical data a special committee, on the report of Mr. C. Matignon, asked for the formation of a provisional committee to study the question, composed of the specialists from the different nations belonging to the Union. This provisional committee will prepare a preliminary plan, which will be submitted for examination to the main committee for the establishment of thermo-chemical standards.

The report of Mr. Trincheri on the determination of the legal value of secret clauses in the request for invention patents was the cause of several important discussions, which were sanctioned by the following resolution:

"The International Union of Pure and Applied Chemistry will constitute in itself a committee of individuals, competent both from a technical and legal point of view to study the questions regarding patents. The Conference pointed out as the most important question to be studied the legal value of secret clauses and the establishment of international patents."

Italy was charged with the preparing of a mode of organization.

The examination of the report of Mr. W. D. Bancroft, Chairman, Division of Chemistry and Chemical Technology of the National Research Council, U.S.A., on the atomic weights, led the Union to form an International Commission of Atomic Weights. The Bureau requested Messrs. Clarke, Thorpe and Urbain to be members of this Commission.

On the request of Professor Oddo it was decided to inscribe on the roll of the first International Congress the following propositions: That the revision of the tables of atomic weights be made every ten years, in order to give the Commission on Atomic Weights, as well as those experimenting on the same, time to control the final determination; and that we revert to Dalton's Theory, which was accepted by Avogadro and Cannizzaro, viz., to take the atomic weights of hydrogen, H-1, as the foundation of the system.

The Conference, on the request of Mr. Charles Marie, agreed to reunite to the Union the International Commission on the Table of Constants.

The Secretary shall present to the Union each year the accounts of the preceding year, the provisional budget, and a report on the activities of the Commission. After being approved this report will be handed over to the International Council of Research for final approval.

In regard to the Physico-Chemical Symbols, at the request of the Chemical Society the Union asked the Chemical Associations and Chemical Journals of the countries belonging to the Union to publish anew the list established by the old International Association of Chemical Societies at its last meeting, held September 23, 1913, at Brussels.

In order to strengthen the works of the Conference, and to call the attention of the different Governments to the importance of the Union, the following text was adopted by the request of the delegates from Denmark:

"The International Conference of Chemistry expressed the desire that all the delegates of the different nations belonging to the Union will make a special effort to make known the public utility of the work carried on by the Union.

"The Bureau shall remit to the Italian Government a report, 'in extenso,' of the activities of the Union, and request that it be officially communicated to the Governments of the different countries."

At the last meeting the Conference decided, at the request of the Polish Government, represented by Mr. Kowalski, to hold its next meeting at Varsovie in 1921.

The organization of the Conference was perfectly prepared by Professor Marotta, General Secretary of the "Consiglio Nazionale di Chemica," which Society, under the presidency of Professor Senator Paterno, did everything to make the delegates' sojourn in Rome as agreeable and profitable as possible.

Special cards were furnished the delegates, which permitted them to visit the museums, monuments and the many wonders of the Eternal City. Receptions and dinners were offered them. In every instance the Italian hospitality showed itself to be full of warmth and kindness.

The Mayor of Rome officially received the members of the Conference. Surrounded by many great Roman dignitaries, he granted them, with every good wish, the freedom of the capital; and the delegates could not have visited under more happy circumstances the treasures which Rome possesses.

On the other hand the Italian manufacturers showed that their country, without ceasing to be the country of art, was also capable of undertaking the industries which modern society demand. Accordingly the delegates were invited to visit three important manufacturing plants, which were developed by the necessity of war materials, and which were actually being transformed into peace industries, viz.: The "Establishment Bombrini-Parodi-Delfini," at Segni, near Rome; the "Establishment Electro Chimica Pomilio," at Naples; and the "Societa Italiana Predotti Esplodenti," at Cengic.

Messrs. Parodi-Delfino, Pomilio and Quartieri, pioneers of Italian industry, assisted by their fellow-workmen, explained to the delegates the methods used to obtain certain results in their plants, both from the viewpoint of labor organization and production. The banquets which they gave the delegates furnished an opportunity for the heads of the different delegations to thank Italy for the cordiality of her reception.

The Naples section of the "Associazione Italiana di Chimica, Generale et Applicata," prepared an excursion to the new excavations which are being carried out at Pompeii. The director-general of the excavations conducted the visitors himself through the excavations, and held them under the charm of his amiable erudition for hours, which seemed altogether too short.

The work accomplished by the International Union during the course of the Conference has a special importance; It constitutes the foundation of a permanent organization which shall make its good works felt throughout all countries.

JEAN GERARD,
General Secretary of the International Union of Chemistry.

Chemical Society News

SPLENDID PROGRAM FOR MONTREAL S.C.I.

The Montreal Section of the Society of Chemical Industry has arranged a program of splendid features for the season of 1920-21. The sessions opened with a "Bang" at the Queen's Hotel, Friday evening, October 22nd, at 6.15 p.m. sharp, the occasion being an informal dinner. No papers were presented, the meeting being simply a pleasant social affair, where acquaintances could be made that would make the subsequent sessions throughout the year doubly interesting. One paragraph on the dinner card of the evening is particularly good, and its message would be well worth while being taken into the serious consideration of all Branch executives. We reproduce it here:

"This Society is planned and run for those in the industries. We propose to have it a meeting ground for the works superintendent, the factory man, the manager and the laboratory man, as well as the man from the university."

The following comprise the executive of the Montreal Section: Chairman, Chas. R. Hazen; Secretary, J. E. Hayden; Treasurer, Geo. McIntyre; Chairmen of Committees: Membership, Dr. R. McLean; Program, J. B. Bell; Finance, F. E. Cornell.

The program, as arranged for the remainder of the season, is as follows:

November 19th.—Symposium on Hard-Wood Distillations Industry. "General Survey of the Industry," Mr. David Gilmour. "Crude Factory Practice," Mr. R. E. Gilmore. "Refinery Practice," Mr. J. A. Wales.

December 17th.—Symposium on the Explosive Industry. "Acids and Raw Materials," Mr. T. R. Ballantyne. "Nitro-Glycerine," Mr. P. B. Yancey; "Dynamite and Gelatin," Mr. R. N. Lyons; "Black Powder," by Mr. R. F. Pollard.

January 21st.—"Technology of Wood Cellulose by the Alkali Process and Soda Recovery," Mr. Robert Woodhead.

February 18th.—Symposium on Packing House Industry. Three papers by members of the Allied Packers, Limited, of Toronto.

March 18th.—Not yet arranged for.

April 18th.—Smoker and dinner.

MONTREAL SECTION PREPARES TO ENTERTAIN.

Members of the Montreal Section, Society of Chemical Industry, have commenced already to prepare plans for the entertainment of the members of the Society from England who will visit Canada next August. As it has been decided to hold the annual meeting of the Society of Chemical Industry (Canada) at Montreal during August, this will bring a large number of Canadian chemists on hand to greet the English members. The Montreal

Section have formed special committees to make arrangements for the event, with chairmen as follows: Finance, A. Neighorn; Publicity, H. J. Roast; Hotels, Major Adams; Program, H. W. Matheson; Excursions, Dr. Reg. McLean; Entertainment, W. E. Allen.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The first meeting of the Toronto Section of the Society of Chemical Industry, for the season 1920-1921, was held at the Engineers' Club, Friday evening, October 29th. Despite the unfavorable weather, there was a good attendance, and the social part of the evening was as thoroughly enjoyable as the papers given were instructive.

Mr. M. L. Davies, of the Standard Chemical Company, the Chairman-elect of the Toronto Section for this season, presided.

Following the usual dinner, a pleasing event took place when Professor E. G. R. Ardagh, past Chairman, on behalf of the members of the Toronto Section, presented Mr. Alfred Burton with a beautiful clock. This was, as Professor Ardagh said, as a slight token of the 20 years of splendid service Mr. Burton had rendered the Society in Canada as Honorary Secretary. The Society had had no more faithful or zealous member and official than Mr. Burton. Now that the former Canadian Section had given place to several local sections (formerly called Branches), there was no further need of a general secretary. Mr. Burton made an appreciative and happy reply, in which he said that it had been a pleasure to him to have done his duty and at the same time to have seen the Society in Canada grow and expand to its present large and important dimensions.

The clock presented to Mr. Burton is electrically regulated by a dry cell so that it will run one thousand days without rewinding.

On adjourning to the lecture room for business and papers, a motion expressing the great loss the Society in general felt, and particularly the Toronto Section, in the death of their late past-chairman, Dr. William Hodgson Ellis, and also expressing condolence to his widow and family, was moved by Professor J. W. Bain, seconded by Mr. Alfred Burton, and unanimously carried. The report of the special committee formed in connection with the holding of the last annual convention in Toronto was presented by Dr. Lash Miller and was adopted. A motion requesting the executive to consider the advisability of the Society appointing a representative to wait on the Tariff Commission, Ottawa, with regard to tariff matters, was moved by Mr. T. L. Crossley, seconded by Mr. Alfred Burton, and carried. The Treasurer announced that the annual grant to the Society from the Ontario Government had been increased to $300.

The reading of papers and addresses was next in order, and those present were treated to two splendid addresses by Mr. M. L. Davies, on "Hardwood Distillation", and by Mr. T. L. Crossley, on "Some Phases of Pulp & Paper Technology". The addresses were informal, that by Mr. Davies dealing mainly with the commercial side of the distillation industry, and that by Mr. Crossley being an illustrated talk, showing by a series of lantern views the process of making pulp as practised in most Canadian mills.

Hard-Wood Distillation.

The address by the Chairman, Mr. M. L. Davies, of the Standard Chemical Company of Canada, on "Hardwood Distillation" proved very interesting and instructive. As pointed out in Mr. Davies' opening remarks, the subject was much too large and important to be more than just lightly touched upon in one evening, but it is certain that those present obtained a clearer idea of the commerce of the industry than they ever had before To those desirous of obtaining a better knowledge of the industry, Mr. Davies referred them to three articles:—that by Dr. Bates in "The Canadian Chemical Journal", May 1917; by James Lawrence in "Journal of Society of Chemical Industry", January 15th., 1918, and by H. O. Chute, in "The Canadian Chemical Journal", August, 1920. The charcoal industry, the basic operation of the distillation industry, was started with charcoal pits in Engand in 1796 near Sheffield, for the production of charcoal iron, and in later years the vapors were recovered, In 1849, the industry commenced in the United States, at Millborn, N.Y., by Scotch manufacturers by the name of Turnbull, and, these works still known as the "Scotch Works", may be considered the parent of the present-day large industry The first plant in Canada was erected by the Standard Chemical Company, at Fenelon Falls, Ontario, in 1897, with a capacity of 20 cords per day

The industry has extended, stated Mr. Davies, until to-day it embraces:—

Canada:— 13 factories, with a total capacity of 130,000 cords annually, yielding 1,000,000 (Imperial) gallons wood alcohol, 12,000 tons of acetate of lime, and 60,000 tons of charcoal.

United States:—100 factories, capacity, approximately, 1,000,000 cords annually, yielding 10,000,000 (American) gallons wood alcohol, 100,000 tons acetate of lime, and 500,000 tons of charcoal.

Continuing, Mr. Davies dealt particularly with the industry as operated in Canada. Beech, Birch and Maple gave the best results, trees below 10 inches diameter being used. The unit is the cord. One cord of green wood weighs 6,000 lbs., but after drying, which is done in the open, this is reduced to 3,800 or 4,000 lbs. It generally takes from 12 to 18 months to season or dry the wood. The wood is piled on 2-cord bogies, and fed into ovens which hold generally 6 cords each, although some ovens hold up to 10 cords. The ovens measure 45x8x8 feet, and are sealed and heated by waste wood and waste gases for 24 hours. The oven charge is then removed, and placed in air tight steel coolers for 48 hours and another 48 hours in the open before loading in the railroad cars so as to overcome all possible danger of spontaneous combustion.

Condensation of Vapors:—One cord is estimated to yield 1800 lbs. of liquor, from which can be made 4% acetic acid, and 4% alcohol, 650 lbs. of gas, (combustible and otherwise), 1000 lbs. of charcoal and 250 lbs. of tar. The yields per cord are:—charcoal, 1,000 lbs.; acetate of lime, 200 lbs.; wood alcohol, 8 gallons. In connection with the derivatives, acetate, acetone, and acetone oils, Mr. Davies referred to the strict regulations required by the British War Office for acetone, and his statement that the Canadian product had never been rejected by the War Office was received with applause. As regards charcoal, the speaker said, while the bags commonly seen in grocery stores did not attract great attention, yet in Canada last year 12,000,000 of these bags were sold.

Chemical Control:—Mr. Davies closed his very interesting remarks by referring to the work of the chemist in the wood distillation plant. In the crude factories, chemical control was unusual, but nevertheless it was necessary and important. More attention should be given to the effect of temperatures, pressures and velocities. He thought that chemists often made a mistake while working in a plant by striving to obtain a certain result, regardless of costs. The chemist, to be successful and to be of use to his company, instead of figuring the results of his recommendations or operations in pounds, tons, or whatever it might be, should, instead, compute the result in dollars and cents, or in other words should always bear in mind the cost

of his operation. Fuel economy was instanced as one item in which the chemist had assisted the distillation business.

The Making of Pulp.

Mr. Crossley's illustrated discourse on pulp-making was much enjoyed. An outstanding difficulty in the practice of many pulp mills was, he pointed out, the pushing of operations in the middle of the mill. in order to keep up with the finishing machines. This was due to lack of mechanical equipment for the middle part of the process, including the bleaching and refining, so that there was often more or less of a tendency for the finishing end of the process to "run away" from the mill. This was frequently noticed when the operator of the bleaching machine added more steam so as to hurry on his part of the process in order to keep up with the finishing machines, despite the fact that this addition of unnecessary steam was bad practice and often effected seriously the grade of pulp required.

Following the addresses, Mr. Davies called on those present to do all they could to support the Society by attending the meetings. The Society had endeavored to maintain a freindly, fraternal spirit at all their meetings, the lack of which had so often "chilled" scientific meetings. "Let us be human," said Mr. Davies, "and maintain that friendly and fraternal spirit that holds any society that accomplishes anything together."

Many expressions of regret were heard, following the meeting, that so little time was allowed the speakers to properly handle their subjects, owing to the lateness in starting the dinner, and the lack of speed in the service. The dinners are called for 6.30 and should commence sharp on time, so as to allow for the proper presentation of papers. It is understood that the executive has this matter in mind when arrangements are made for the December meeting.

Mining and Metallurgy in British Columbia.

(Special Correspondence to Canadian Chemical Journal.)

On October 1, J. J. Warren, President of Consolidated M. & S. Co., appeared before the Canadian Government Tariff Commission, in session at Trail, and stated that so far as his company was concerned, the chief complaint he had to offer was the removal of 7½ per cent. war tax on metal imports. Believing that this would remain in force for some years, at any rate, his company had invested more than a quarter of a milion dollars in the development and equipment of a fluorite deposit, from which to make hydrofluosilicic acid, which was used as an electrolyte in the electrolytic refining of lead bullion at Trail. The company was committed, too, for the expenditure of a like amount in the erection of a copper-rod mill, now in course of construction. Until his company erected its copper refinery, no copper was refined in Canada, practically all the blister-copper produced in Canada being refined in the United States. His company's refinery now had a capacity of fifty tons of refined copper daily, and it was to find a market in Canada for this output that the rod-mill was being erected.

The company's output of refined lead, Mr. Warren said, was about 100 tons per day, which was about equal to the Canadian consumption during normal times. Up to 1919 the Canadian tariff was 15 per cent., plus 7½ per cent. war tax, as against the United States tariff of 25 per cent. Last year the whole of the Canadian tariff was removed and a specific duty of one cent. per pound imposed. Competitively this placed the Canadian producer at a grave disadvantage. Besides the advantage in tariff. the United States producers were nearer to the principal markets of the continent, and had the advantage in freight rates.

In reply to a question by Sir Henry Drayton, chairman of the Commission, Mr. Warren said it was true that his company paid a dividend of 10 per cent. last year and at that rate for the first three-quarters of this year, but to do so it had been necessary to draw on the reserve fund to the extent of more than half a million dollars.

Revision in Property Tax Requested.

On October 12 a deputation, representing probably 90 per cent. of the mining and metallurgical interests in the Province, waited upon the Hon. William Sloan, Provincial Minister of Mines, to request a revision in the taxation on mining properties, to provide for an allowance being made for the depletion of ore in mines, and for a reduction of the tax on capital invested in mining industries. Under the existing system no allowance is made for depletion. An allowance is made for capital that has been raised within the Province, but such capital plays a small part on the total amount of capital invested in the mining industry of the Province, by far the greater portion coming from outside sources. The Minister promised that the matter would be brought before the Government.

Copper Mill at Allenby in Operation.

After an almost interminable series of delays, the Canada Copper Corporation started its big mill, at Allenby, on October 19. It was expected that the mine and mill would have been started last year, but the company has been unfortunate in having to contend with an endless round of labor trouble that has not only delayed operations and caused a serious loss in that way, but has entailed an increase of $500,000 to the outlay, owing to increase in cost of labor and supplies during the delay. The whole outlay for mine, development, mill, and railway involves an investment of $7,000,000. At the present time 300 men are employed at mine and mill, but this number will be raised to between 500 and 600 as soon as suitable men can be secured. It is hoped that by the end of the year the mine will be turning out 200 tons of ore daily, which is the present capacity of the mill. The mill has been so constructed, however, that the capacity can be doubled without interfering with its operation. The concentrate will run in the neighborhood of 25 per cent. copper, and arrangements have been made for its treatment by the Consolidated M. & S. Co., at the Trail smelter. In fact, it was for the purpose of treating this concentrate that the Consolidated Company increased the capacity of its copper refinery to 50 tons of refined copper daily and is now building a copper-rod mill. The Copper Corporation's bad luck seems not to have left them entirely, as operations have been started with the price of copper at a lower figure than at any time since last June. At its mine, at Copper Mountain, the Copper Corporation has developed an ore-reserve of more than 12,000,000 tons, which will run about 2 per cent. copper, with low values in gold and silver. Besides the development of the mine and the equipment of the mill, the investment includes 12 miles of mountain railway, a large part of which was through exceedingly rugged country, entailing difficult and costly construction.

IRON AND STEEL INTERESTS COMBINE.

The firm of Harland & Wolff, Belfast, Ireland, has acquired a controlling interest in Messrs. David Colville & Sons, Ltd., iron and steel makers, of Motherwell, Scotland. The announcement was made by Lord Pirrie, of Harland & Wolff. The output of steel of the Colville Company is the largest in Great Britain; they have huge works in Motherwell and an extensive plant in Ayrshire. In addition, the combine embraces the collieries of Russell & Co., of Glasgow and Lanarkshire.

THREE-PHASE ELECTRIC BRASS FURNACE OF NOVEL DESIGN.

Metallurgical and chemical engineers for a considerable period of time have been endeavoring to solve the question of melting brass and other non-ferrous metals in the electric furnace in the most efficient and economic manner, realizing, as they have, that there was no question of higher production when melting electrically so long as certain metallurgical features of the process could be properly overcome. As a result of considerable research work, single-phase, and even two-phase electric brass furnaces have been designed and put on the market, some of which seemed to solve the question of melting these metals electrically. It has, nevertheless, been a cherished desire of those interested in this branch of the work that one day a three-phase unit might be developed which would do the melting more efficiently and economically, and it will be highly interesting to the engineers in the metallurgical and electrical field, and those most intimately connected with this branch of the industry, to know that at last this dream has been realized.

The Volta Manufacturing Company, Limited, of Welland, Ontario, have had their engineering staff at work for some months past developing a three-phase electric brass furnace along the lines of what they considered would be the most efficient piece of apparatus to meet the requirements of the brass and non-ferrous metal industries, and have now put on the market a three-phase electric furnace which they claim is superior to anything heretofore developed for this class of work.

As will be seen by the illustration of the furnace, the shell is of a cylindrical design and is operated in an upright position—similar to the electric steel furnaces. The furnace is lined with refractory brick, and the roof is also made of refractory material. The furnace is provided with a cast-iron base equipped with a motor-driven set of gears and rollers, which gives to the furnace a natural gyratory movement.

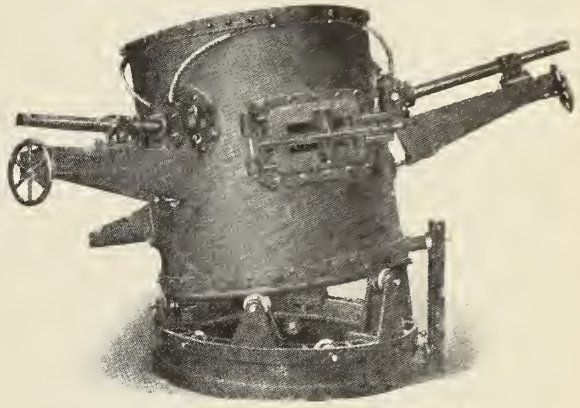
One of the strong features of this furnace is that it is a three-phase unit, which means a balanced load on the lines of the Power Company, and consequently a better power rate for the operator. It is quite generally known that many power companies, having a limited amount of power on their lines, do not desire and will not permit the operation of a single-phase unit on their lines except at a very high power rate.

On account of having three electrodes it is not necessary to maintain the same degree of perfect alignment of electrodes as is necessary with the single-phase unit, in order to maintain a high degree of efficiency, and inasmuch as the arcing takes place between the three electrodes, the arcing is distributed over a much wider area than in the single-phase, two-electrode furnace, and consequently much better melting facilities are provided. As shown in the illustration the electrodes enter the furnace through the side of the shell at points 120° apart. Graphite electrodes are used, and are supported on heavy cast-iron arms, which latter are provided with guides to take the electrode holder. The construction of these arms provides a substantially insulated sleeve around the electrode, which is kept cool by means of a water-cooled collar. This latter is in the form of a ball-point, and by this arrangement the position of the electrodes can be changed relative to each other, at the same time making provision so that the electrodes can be lowered or raised in respect to the metal bath.

The electrode holders move in the guides provided in the cast-iron arms. This movement is obtained by means of heavy screws, actuated either by hand or through a simple system of motor-driven gearing.

The charge, as will be noted, enters the furnace below the electrodes, and it is not necessary to withdraw the electrodes from the furnace at any time, either during the charging or pouring period, which eliminates any chance of electrode breakage due to the heavy scrap falling on the electrodes. This gives a longer life to the electrodes, and also eliminates the loss of time and the expense ordinarily incurred in removing and replacing the broken electrodes.

The roof of this furnace is independent of the shell. This permits of the relative height of the roof to the bath being designed in such a manner as to insure the best



Three-Phase Electric Brass Furnace.

melting conditions, as well as the least possible fusing of the refractories. A vent hole with a light cover is provided in the roof of the furnace, which allows of the operating of this furnace under tight conditions with perfect safety. Should gases, formed from the use of oily or dirty material in the charge, reach a certain pressure they are allowed to escape through this vent in the roof.

In actual practice it has been found that the heat from the arc is sprayed down and over the metal in such a manner as to heat the whole surface of the metal evenly. The effect of this is very important, as it reduces the volatilization losses in the metal being melted to a minimum, and the linings, not being subjected to any high temperatures, last much longer.

The motion given to the furnace, by means of the combination of gears and rollers, has proved itself to be a very efficient and natural mixing one, by means of which superheating of the metal is practicallly eliminated.

This furnace has been subjected to some very severe tests, and has proved itself to be an efficient and economical melter, and is very simple in construction and easily handled. When running on yellow brass, metal has been produced with a current consumption as low as 225 K.W.H. per ton of metal produced, and when running on aluminum bronze the current consumption averaged about 300 K.W.H. These figures were not taken at a time when the furnace was operating continuously, and it is only reasonable to expect that the power consumption will be considerably reduced when the furnace is thoroughly heated and is being operated continuously.

At the present time the manufacturers are producing these furnaces in the following standard sizes: 500 pounds, 1,000 pounds and 2,000 pounds, having a transformer capacity of 125 K.W., 175 K.W. and 300 K.W. respectively.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Fuel and Method of Manufacturing Same.

L. W. Bates, 204259, September 28, 1920. A stable mobile fuel consists of liquid hydrocarbon having therein particles of carbonaceous substance in solution, colloid and suspension states. The finely pulverized coal or coke is mixed with the liquid hydrocarbon, a stabilizer such as lime-rosin soap and of a peptizing agent such as creosote, and the whole blended into a homogeneous mixture.

Open Hearth Furnaces.

Frank B. McKune, 204114, September 21, 1920. An open hearth furnace in which is included a main air port that discharges onto the hearth has a gas port in connection with the main air port adjacent its discharge end, a pair of supplemental air ports that extend vertically, one at each side of the main air port, and which discharges along the crown of the furnace, a damper in each supplemental air port and means for adjusting the dampers.

Method of Lowering the Viscosity of Liquids.

L. W. Bates, 204260, September 28, 1920. A stable liquid fuel comprises liquid hydrocarbon and dehydrated water gas tar, the hydrocarbon may contain pulverized carbonaceous substance. The dehydrated water or oil gas tar is added in quantities to give the required viscosity and the components are heated at 175 to 220° F. until they adequately commingle.

Transporting Carbonaceous Substances.

L. W. Bates, 204262, September 28, 1920. Carbonaceous substances may be transported through pipes by reducing the substance to the form of particles, combining the particles with liquid hydrocarbon as a carrier which is fixated by the addition of lime-rosin soap and passing the composite through pipes. The viscosity of the carrier may be varied and the ash may be removed from the carbonaceous substance in a specified manner.

Method of Raising the SP. G. and Flash Point of Liquids.

L. W. Bates, 204261, September 28, 1920. Safety against fire of a liquid fuel is increased by enabling it to support a layer of water and to have a higher flash point. This is done by adding to the liquid pulverized carbonaceous material and rosin-lime soap as a stabilizer and blending the components together. Dehydrated water gas tar, which is a peptizing agent and stabilizer, may also be used.

Apparatus for the Production of Mobile Fuels.

Lindon W. Bates, 204263, September 28, 1920. Structural features of apparatus for producing colloidal fuel.

Processes of Treating Peat.

Nelson DeLong, 204281, September 28, 1920. Water is removed from peat by mixing with the peat 0.5 to 1% Na_2CO_3 and exposing the mixture to the air, preferably after forming into briquettes.

Method of Treating Stable Mobile Fuel.

Lindon W. Bates, 204264, September 28, 1920. A stable liquid fuel is produced by mixing finely pulverized solid carbonaceous substance with liquid hydrocarbon and a stabilizer such as lime-rosin soap, and removing suspension sized particles.

Method of Stabilizing Fuel by Congelation.

Lindon W. Bates, 204265, September 28, 1920. The separation of the components of a mobile fuel comprising particles of carbonaceous substance and liquid hydrocarbon is delayed by freezing the fuel until it approaches a solid and maintaining the congelation.

Fuel.

Lindon W. Bates, 204266, September 28, 1920. A stable mobile fuel comprising an admixture of pulverized solid de-ashed carbonaceous substance and liquid hydrocarbon is prepared by removing ash by flotation from pulverized carbonaceous substance and stabilizing the particles of purified substance in liquid hydrocarbon. The solid substance may be pulverized in a liquid hydrocarbon having peptizing qualities and the froth formed in water containing the carbonaceous particles from which ash separates is destroyed by adding oil thereto. The froth and oil mixture is dehydrated by evaporation.

Liquid Fuel.

Lindon W. Bates, 204267, September 28, 1920. A stable liquid fuel heavier than water is produced by pulverizing solid carbonaceous substance in liquid hydrocarbon of low viscosity, heating the mixture during pulverization and blending therewith further liquid hydrocarbon.

Utilizing Coal Slimes.

Heinrich Brune and Heinz Horst, 204429, September 28, 1920. Coal slimes are mixed with coke breeze before they have settled and the water is expressed from the mixture.

Drying Raw Peat.

Heinrich Brune and Heinz Horst, 204430, September 28, 1920. Raw peat is cut into small particles while preserving its fibres in an uncrushed condition. The particles are added to a dry comminuted admixture of peat without mixing, and the raw peat and admixture are pressed to remove moisture. The product may then be briquetted.

Overseas Notes.

(Special Correspondence to Canadian Chemical Journal.)

One of the consequences which have followed upon the vast development of the explosives industry of the United Kingdom during the war is the combination of some ninety-three of these factories in England and abroad in one concern, styled Explosives Trades, Limited, with its head office in London, and dealing on a large scale in artificial fertilizers, acetones and ketones, ammonia arsenite of soda, bisulphate, black ash, calcium chloride, caustic soda (70-72%), chloride of lime, collodion and solutions thereof, dyes, glycerine, ground sulphur, hydrochloric acid, methylated ether, nitre cake, nitric acid, nitrate of thorium, nitrate of lead, nitrated wood pulp, nitrated castor oil, oleum, salt cake, saltpetre, sulphate of lead, sulphuric acid, Welldon mud, white lead (dry and in oil), etc.

The Fuel Research Board in London (Eng.) have just published an interim memorandum on fuel for motor transport, which deals chiefly with the possibility of substituting power alcohol for petrol as a motor fuel, and is divided into three sections: (1) Historical; (2) The present position of power alcohol; (3) Alternative motor fuels. The memorandum can be obtained from His Majesty's Stationery Office, Imperial House, Kingsway, London, W.C. 2, at the price of fourpence, which includes postage.

The Swedish State Medicinal Board is working out a plan for the establishment of a large central laboratory, with the object of centralizing the manufacture of medicine in that country.

A company has been established, the object of which is to carry on the manufacture in Switzerland of cellulose alcohol. Experiments which have been made with the production of alcohol from sawdust cellulose have proved successful, and it is thought that in commercial practice its price should be lower than the output from sugar beets or of synthetic alcohol.

Prevention of Occupational Diseases and Epidemics.

An organized effort is to be made in London to secure funds for the establishment of a Chair of Industrial Medicine at St. Mary's Hospital, the aim of which will be to train doctors in the elements of industrial hygiene, and to co-operate with employers and others, so that practical as well as theoretical instruction may be afforded. Speaking generally, the idea is that the Professor of Industrial Medicine at St. Mary's Hospital should devote his attention to: (1) Occupational diseases (e.g., potters' phthsis; (2) Diseases common to all trades (e.g., influenza, etc., epidemics); and he would get in touch with the heads of the principal industries and discover what special diseases were leading to loss of working hours, following this up with research work and preventive measures. Such subjects as the effect of fatigue on efficiency would come within his scope, and from his laboratories would eventually be provided a service of doctors thoroughly conversant with industrial health problems, and keenly alive to the national importance of the branch of medicine to which they had devoted themselves. As an example of the saving which may be effected by the scientific investigation of disease, it may be mentioned that, owing to the assiduous work of Dr. Lister Llewellyn, the cause has been discovered of "Miner's Nystagmus," which is estimated to be costing the country at least £1,000,000 a year. The wastage in the industrial world owing to sickness may be compared with that incurred

among our soldiers in France during the war. Before concerted measures were taken to master the problem of gas casualties, for example, as much as 90 per cent. of the cases had to be sent to England from one hospital in Boulogne. Scientific investigation enabled the percentage to be reduced to two. It may be safely claimed that the loss of wages and of output through epidemics and occupational diseases is in equal degree preventable, given the necessary facilities for research.

The German glass industry has remained comparatively unaffected by the prevailing depression in that country. A steady demand for ordinary glassware has been maintained, and the majority of glassworks have been constantly occupied with orders, the output of pressed glass products being hardly able to keep pace with consumption. In ground and crystal glass, however, trade was poor, this industry being almost wholly dependent upon foreign orders.

Industrial Research Makes Progress.

In presenting the annual report of their Advisory Council for the year ended July 31, 1920, the Committee of the Privy Council (in London) for Scientfic and Industrial Research remark that more rapid and extensive progress in the organization of research has been made during the period under review than had been anticipated. The establishment of industrial research boards for particular industries or groups of industries has been successfully proceeded with, and in addition it has been recognized that there are certain subjects for research of interest equally to all industries. Much has been done by means of grants for the encouragement of the individual research worker. The Research Department has spent, or is committed to an expenditure of over £600,000, and as negotiations are proceeding for the formation of other research associations, the total commitments are expected to reach £800,000. In many problems the National Physical Laboratory has been able to render valuable service, and large numbers of tests have been conducted for private firms, Government requirements being, of course, much less than during the war. Some important work has been performed by the Fuel Research Board, the Food Investigation Board, by the Building Materials Research Committee, etc.

Scarcity of Intermediates for Dye Manufacture.

Imports of German dyes into Great Britain during the first six months of 1920 amounted to 387 tons, and during the same period 881 tons were sent to the United States, the quality, it is said, being superior to that sent to the United Kingdom. At the moment there is in England a real scarcity of intermediates used in dye manufacture, and importation of synthetic dyestuffs from any foreign country is entirely free from any restrictions. Not only German but American, Swiss and German manufacturers are hoping to benefit from this free market, but the quality and range of the Americans and Japanese are severely limited at present. It has been announced recently that the legal termination of the war—whenever that may be—will automatically put an end to the present export restrictions on chemicals and dyestuffs in Great Britain, an exception being fertilizers. The British output of dyestuffs now exceeds the total consumption of the United Kingdom before the war, and while many difficulties still remain to be surmounted, manufacturers are by no means dissatisfied with the quiet headway that is being made, believing that in time the British color industry will be able to produce all that is required. The British trade in photographic materials and appliances is also in a thoroughly stable and progressive condition, important progress having been made during the war in the production of chemicals, sensitized papers, lenses, cameras, etc.

With the approval of the Development Commissioners in London, the British Ministry of Agriculture has recently made grants-in-aid to enable certain workers in agricultural research institutes to travel abroad for short periods, so that they may become acquainted with research methods and organizations in other countries. For the coming year three such grants have been made.

The only solution of the gasoline problem, it has been stated, so far as the United Kingdom is concerned, is to produce motor spirit in Great Britain, and this can be done by the utilization of material now going to waste or lying fallow in the coalfields. Mr. J. A. Green and Mr. F. M. Perkin, the well-known chemists, have announced recently that one of the most reputable constructional engineering firms in the country will contract to supply and erect a plant to treat 300 tons of material per day of eigbt hours at an inclusive cost of £20,000. In addition to the cost of the plant, £10,000 would be required for working capital. This plant, it is believed, would produce 180,000 gallons of spirit per annum and 1,800,000 gallons of crude oil. The cost of the raw material would be £35,000 per annum, and treatment, administration and depreciation would cost £15,000, making the cost of motor spirit less than 6d. per gallon and 5d. per gallon for crude oil.

BOOK REVIEWS.

"CHEMICAL REACTIONS: THEIR THEORY AND MECHANISM."

By K. George Falk. D. Van Nostrand Co., New York. 211 pp. Price, $2.50.

This book is a presentation of modern viewpoints on the theory of reactions, having as a general aim the problem of establishing satisfactory common ground for organic and inorganic reactions. It has been written after full consideration of theories and experimental work of leaders in the field, and gives a number of new viewpoints which have been presented by Prof. J. M. Nelson to students taking post-graduate work at Columbia University.

For the University professor, research worker and advanced student, a most inviting series of chapters is arranged. Much that is new and rather hazy in the minds of many, or utterly unknown to them, will be found set down in most logical order. Anything that tends to put the reactions of organic chemistry on a higher and more generalized plane should be welcomed by those teachers of the subject who are interested in the more minute study of the mechanism of organic reactions.

A full discussion of the general question of valence forms an introduction to the conception of a "Co-ordination Number," as developed by Nelson, and a review and discussion of the Werner method of nomenclature and representation of complex compounds, double salts, ammoniates, etc. The possibilities of tautomerism in the inorganic field are outlined, and specific examples taken up.

In Chapter 13 full consideration is given to acids and bases, and a method of representing their properties graphically is developed, which utilizes conceptions brought out in previous chapters. Some general relationships, not usually considered, are pointed out, and a further expansion of the co-ordination number conception

and its relation to atomic valence is developed. In Chapter 4, modern conceptions of catalysis are tersely stated.

Following some general considerations of a novel character, chapters are devoted to a classification and discussion of certain well-known organic reactions. These are taken up in such a way as to develop a few broad generalizations of the greatest significance, and, in particular, the possibilities of reducing a vast number of organic reactions to one general equation. The work is completed with a full discussion of oxidation and reduction reactions in the organic field.

There is no doubt but that this book will be welcomed as one of the best efforts yet presented on the general question of relating organic to inorganic reactions, and the better presentation of formulae representations. The research work outlined is, in many cases, long overdue, and until more effort is directed along the lines suggested, we cannot hope to make that true progress, which must come only through a better grasp of new generalizations that appear awaiting interpretation. For the vast majority the conceptions presented will be quite new, and for all very stimulating.

"THE CARBOHYDRATES AND ALCOHOL."

By Samuel Rideal and Associates. Bailliere, Tindall & Cox, London. Westman Press, Ltd., Toronto. 216 pp. $3.25.

In a small volume it is impossible to do much more than point out developments, stimulate interest, and refer to recent progress. There is undoubtedly a place for the monograph. Sometimes the references given to world literature are of great labor-saving value. This book answers the purpose for which it was designed in these respects. The industries are always in mind, as well as their chemical problems, and the combination is instructive. The properties and manufacture of starch, dextrin, glucose and maltose are all outlined in the first part of the book. The second part is devoted to the sugars and treats with them in a similar manner. Cane and beet sugar production are well treated, but there are evidences of hurried reading and scanty information when such questions as the production of maple sugar and syrup are considered. This is really one of the most serious faults of English or European books. American practice is not fully appreciated. While this may detract in matters where a subject is discussed at long distance, it has no bearing on chapters relating to alcoholic fermentation and the production of beer, vinegar, fruit extracts, wines and industrial alcohol. Here English and European practice is worthy of attention in America.

Such a book as this is most suitable for the young industrial chemist and the business man who wishes to keep abreast of modern developments. Naturally, men from the specialized industries concerned find these outlines and comparisons of general practice stimulating.

"THE MODERN ELECTROPLATER."

By Kenneth M. Coggeshall. 276 pp. Norman W. Henley Publishing Co., New York. Westman Press, Ltd., Toronto.. Price, $3.50.

It is always interesting to review the efforts of an author to place applied scientific facts in order before a practical man who belongs to a well-established semi-scientific trade. Severe criticism cannot be applied to a book which obviously is meant to be placed in the hands of workmen who are training themselves in the shop. If they can be taught to read their subject by such books, a much more rapid spread of general knowledge and good practice will result.

The review of the advance of the electroplating industry and some elementary considerations of chemistry and electricity are more likely to rather stultify the inquiring mind than to help it. The statement, for example, on page 17, that "fortunately but few elements are of concern to the electroplater," is not good. There is nothing very fortunate about it, or, for that matter, remarkably correct. The modern electroplater is concerned, or should be, with about as many elements as anyone else. While the plater may not be interested, in his opinion, in an expansive conception of the chemistry and electricity involved in his operations, it might not be out of order to supply him with a few broader conceptions.

The book must be judged on its value as an aid to practice, and as such it fills its mission. Chapters are presented on:

(1) The location and construction of the plating room.
(2) Electrical equipment for plating room.
(3) Electroplating tank equipment.
(4) Preparation of work for plating.
(5) Plating solutions and the electro-deposition of metals.
(6) Polishing, buffing and lacquering.
(7) Reference data.

These chapters are written in a very helpful way, showing full operating instructions, and should give even a plater of the broadest experience a better general grasp of all his operations. For those whose experience has been short or limited in any way, they amount to courses of instruction. The book is a handy size, and worthy of the attention of all platers.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

With some few exceptions the feature of the chemical market during the past ten days has been a decline in prices. The decline is much more marked in the fine and pharmaceutical chemicals than in the heavy, but some of the most important heavy chemicals have not escaped the prevailing tendency to drop. A few of the heavy chemicals, such as bleaching powder and magnesium carbonate, are increasingly hard to get and have advanced. Buying has not been up to the mark, due to the standing off of buyers who are expecting the prices on many chemicals to drop further. The result is that buyers are not inclined to contract unless given contracts, such as one well-known Canadian firm does of allowing their contract customers to purchase in the open market should prices take a slump. During the first two weeks in October the American market witnessed a price cutting display that was remarkable, but was finally abandoned by the majority of holders of stocks who had entered the price slashing melee in order to stimulate trade. Once this was stopped further declines in the heavy chemicals, at least, have been of little consequence. It would appear that the lowering of prices in heavy chemicals has about reached the lowest rung, and while there may yet be a slight falling off, it is not expected that there will be anything spectacular.

But a different story may be told in the fine and pharmaceutical chemicals, and one would not be wise to pre-

dict at this date just when the bottom of the descending price scale will be reached. Demand is naurally light, buyers waiting to see what the next price will be. In the American market the competition between resale holders of goods has been and is to-day very keen. Second-hand dealers are a very strong factor on the American market, with the result that resale prices are consideably below manufacturers' quotations, who, in many cases, are forced to sell goods, produced with high-cost raw materials, at a loss.

Bleaching Powder—Bleaching powder is very scarce. Canadian sources of supply have been held up in manufacturing operations by lack of coal and other hindrances, while American sources are, of course, entirely out of the question, as they have all they can do to supply their own wants. Some English bleach has been offered in Toronto in carload lots at 7⅛ cents per pound, duty paid, with delivery in five or six weeks. Contracts are being made by Canadian makers at from $4.50 to $5.50 per 100 pounds, depending on the size of the order, but delivery is delayed until works operations catch up with the demand.

Sulphuric and Muriatic Acids—The Canadian market in sulphuric acid does not show as much weakness as in New York. Prices at Montreal and Toronto for the 66° have remained at $3.00—$3.25 per 100 lbs., but not a few expect this quotation to shade off when some new sources of sulphuric are opened to the trade next month. On the American market producers are quoting the 66° at $21.00 per ton in tank car lots, f.o.b. works, and it is said that some sales have been made as low as $19.00 per ton on the same basis.

Magnesium Sulphate—Magnesium sulphate is easier, being quoted at 5 to 5½ cents per lb., or at $90 per single ton for the medicinal grade, and from $80 to $85 per ton in car lots for the technical grade. The Canadian natural salt continues to sell well and producers report increased sales.

Sodium Bichromate—A decided drop has occurred in sodium bichromate, which is now quoted in bbl. lots at 35 cents per lb.

Alcohols—Pure ethyl alcohol, 65 o.p., is now quoted at $12.50 per Imperial gallon at the Canadian Government Vendors. This is also a decided drop from the $15 and $16 quotation of the summer months. Methyl is quoted at $3.50 per Imperial gallon, while the wood alcohol prices are also easier. A complete list of wood alcohol prices has been added to our market quotations, to which the reader is referred.

Potassium Bromide—Notable drops in quotations have occurred in all the bromides. Potassium bromide is now quoted at 80 cents per lb. for both granular and crystals.

Pyrogallic Acid—Pyrogallic acid is one of the few showing advances, and is offered at $3.50 per pound at Toronto and Montreal.

Stearic Acid—Stearic acid is lower by 5 cents from October quotations.

Salicylic Acid—Quotations on salicylic are down considerably, the ruling price at present being from 75 to 80 cents per pound. In the United States so dull is the salicylic market that some manufacturers have closed down their salicylate factories.

Oils.

There is a decrease prevalent in lubricating oils and fuel oil is sligthly lower, the latest price being 17 cents per gallon. Mid-Continent crude and Pennsylvania crude remain firm, despite the belief held generally a few weeks ago that they would ease off a little. Undoubtedly the recent advances in freight rates on both sides of the line preclude any chance of much of a drop. There has been much heard lately concerning the finding of oil in Northwest Canada, 150 miles south of the Arctic Circle. The facts are that while oil has been found in promising quantities, yet officials of the Imperial Oil Company advise patience and saneness on the part of those interested until further details are received. And while the oil is, apparently, there in commercial quantities, it should be remembered that a great problem is involved in bringing it 1,300 miles, either by pipe line, railroad or steamboat.

Metals.

In general metal prices are easier at Montreal and Toronto as compared with those obtaining on October 1st. Copper casting is bringing 22 cents per lb. and 22½ cents for the electrolytic, though car lots may be had for 21½c. Lead in car lots is quoted at 9 cents per lb., and in lesser amounts at 9½c. Tin is lower at 53c., but zinc sheets have advanced to 25 cents per lb. Aluminum is also advanced slightly, and the Toronto price on Nov. 4th was 35½ cents per lb.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs	6.50— 6.75
Ammonium Bromide	Lb.	.. — .75
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 5.50
Ammonia, Aqua 26	Lb.	.10½— .12
Ammonium Carbonate	Lb.	.20— .22
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—50.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	.. —.07⅛
Borax, crystals	Lb.	.. —.09¾
Boric Acid, powdered	Lb.	.. —.16¼
Calcium Carbide, in carload lots	Per Ton	.. —85.00
Calcium Carbide, per single ton	Per Ton	.. —90.00
Calcium Carbide, less than ton lots		.. —96.00
Calcium Chloride, fused	Per Ton	45.00—50.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .16
Carbon tetrachloride, drums	Lb.	.19— .23
Caustic Soda, ground, drum	Lb.	.06 1/5— .07
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.09¾—.10¼
Corosive Sublimate (Mercuric Chloride)	Lb.	1.50— 1.60
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.17— .19
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.05— 05½
Mag. Sulphate, B.P., Medicinal	Single Ton	95.00—110.00
Mag. Sulphate, B.P., Technical, car lots	Ton	80.00—85.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.08¾—.09½
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .80
Potassium, Bromide, granular	Lb.	.. — .80
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .42
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.45— .50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.35
Potassium Iodide	Lb.	.. — 4.55

Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03¼—.03½
Sodium Acetate, ton lots or over	Lb.	.. —.12½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.. — 1.15
Sodium Bicarbonate, 100% pure	100 Lb.	4.00— 4.50
Sodium, Bichromate, bbls.	Lb.	.. — .35
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.. —.04¼
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.34— .35
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.25— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	2.25— 2.50
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .50
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.00— 4.25
Sulphuric Acid, 66 Be, carboys	100 Lb.	3.00— 3.25
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.47— .50
Tri-sodium Phosphate	Lb.	.08¼— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.. —.06¾
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic Acid, 28%, carloads	Cwt.	.. — 5.50
Acetic Acid, 28%, 25-bbl. lots	Cwt.	.. — 6.25
Acetic Acid, 28%, 15-bbl. lots	Cwt.	.. — 6.50
Acetic Acid, 28%, 10-bbl. lots	Cwt.	.. — 6.75
Acetic Acid, 28%, 1-bbl. lots	Cwt.	.. — 7.00
Acetic Acid, 80%, bbls. or over	Lb.	.. — .19
Acetic Acid, 80%, lesser amounts	Lb.	.. —.21¼
Acetone, pure, drums or over	Lb.	.. — .28
Acetone, pure, lesser amounts	Lb.	.. — .33
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, acetone, bbls. or over	Gal.	.. — 2.90
Alcohol, acetone, lesser amounts	Gal.	.. — 3.10
Alcohol, pure, hbl., 65% O.P.	Gal.	.. —12.50
Alcohol, methylated, hbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 3.45
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 3.55
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 3.80
Alcohol, wood, 97%, bbls.	Gal.	.. — 3.60
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 3.70
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 3.95
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 2.27
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .80
Formaldehyde, bbls. or over	Lb.	.. — .45
Formaldehyde, 200-lb. kegs	Lb.	.. — .48
Formaldehyde, 100-lb. kegs	Lb.	.. — .50
Formaldehyde, 50-lb. kegs	Lb.	.. — .52
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		3.00— 3.50
Oxalic Acid	Lb.	.50— .55
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.75— .80
Stearic Acid, Double Pressed	Lb.	.35— .40
Stearic Acid, Triple Pressed	Lb.	.38— .42
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17¼—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17¼
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.75— .80

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. —.35½
Antimony	Lb.	.. — .09
Brass, yellow ingots	Lb.	.. — .18
Brass, red	Lb.	.. — .21
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. — .22
Copper, electrolytic	Lb.	.. —.22½
Copper, electrolytic, in car lots	100 Lb.	.. —.21½
Gold, Pure	Oz.	.. —45.00
Iron, Pigs	Ton	.. —60.00
Lead	Lb.	.. —.09½
Lead, in car lots	Lb.	.. — .09
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	.. —105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .53
Zinc, sheets	Lb.	.. — .25

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .42
Motor Gasoline (service stations)	Gal.	.. — .45
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .41
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .17
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots	(Imp.) Gal.	.. — 1.90
Rosin, Grade G, in 280 bbl. lots		.. —15.50
Rosin, Grade W.W., in 280 bbl. lots		.. —16.50

Gums and Vegetable Oils.

Vegetable Oils—		
Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .28
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	1.35— 1.40
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	1.38— 1.43
Monopole Oil	Lb.	.. — .30
Gums—		
Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.75
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .21
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

Fertilizer Materials

Steamed Bone Meal	Per Ton	70.00—75.00
Pure Ground Blood, per unit of Ammonia		.. — 8.00
Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10

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- Red Seal Florence Zinc
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- Para Red
- Scarlet Lake

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- Manila Chips
- Batavia Damar
- XXKauri Gum
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NATIONAL U.S.A. DYES

THE Sixth National Exposition of Chemical Industries recently held in New York, demonstrated the progress made by the New American dyestuff industry.

¶ The exhibit of the National Aniline and Chemical Co., Inc., visualized the application of its dyes for all purposes. The costumes worn by life size wax figures, gave a practical illustration of the extent of the Company's ability to meet the demand for color on all materials, wool, silk, cotton, leather and wood.

¶ To those who were unable to visit the Exposition in person, an artistic booklet descriptive of the Exhibit, and giving a full account of the activities and descriptions of the Company's plants, will be sent on application.

Ask for Booklet No. 67

National Aniline and Chemical Co., Inc.

GENERAL OFFICES

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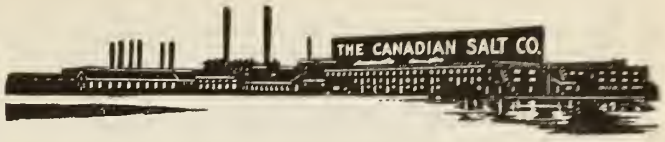

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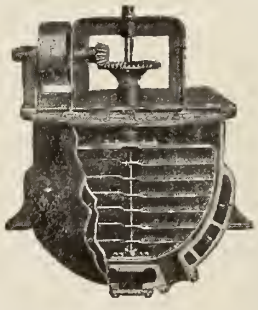

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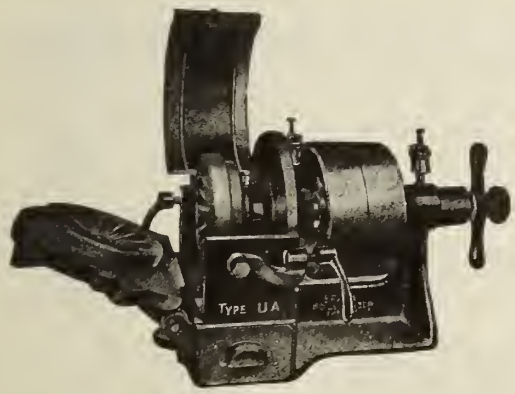

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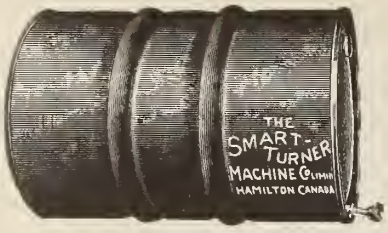

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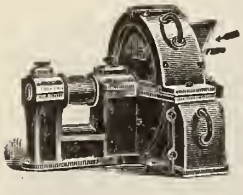

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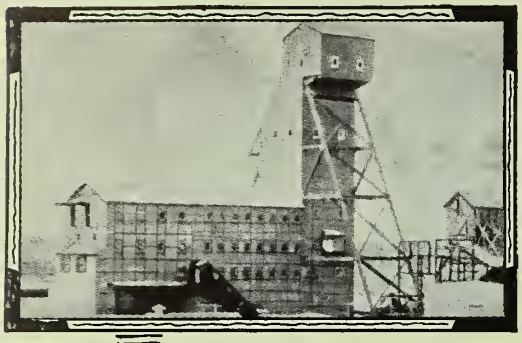

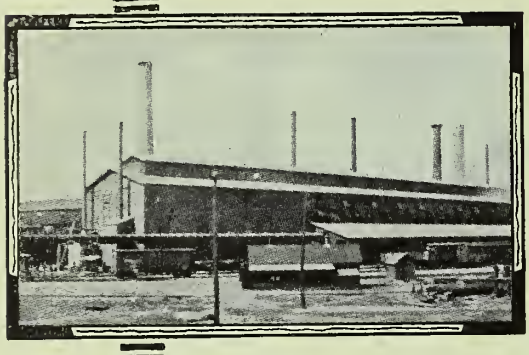

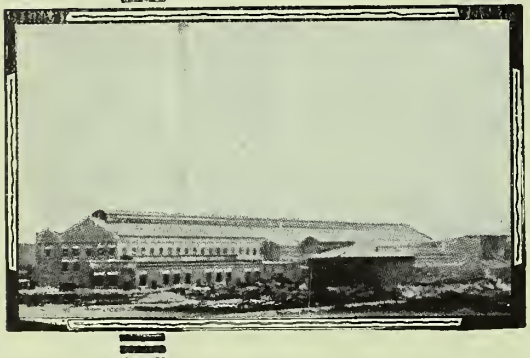

Inco Service

THE plants in Canada that produce nickel are among the best of any in the metal industry.

The Creighton mine, the Copper Cliff Smelter, and the Port Colborne Refinery of The International Nickel Company of Canada, Limited, are the largest of any in this important Canadian industry.

No expense has been spared to make these plants the most modern and efficient in every detail and consequently they are able to render a "Nickel Service" recognized the world over.

INCo

INCO NICKEL

Shot—High and Low Carbon. Ingots—25 lb. and 50 lb. sizes. Electrolytic Nickel—99.80%.

Prime Metals for the manufacture of Nickel steel, Nickel silver, Anodes and all remelting purposes. It is also produced as rods, sheets, strip stock, wire and tubes.

INCO MONEL METAL

The name Monel is given to a line of metal products produced by The International Nickel Company from a natural nickel alloy—67% nickel, 28% copper, and 5% other metals. These products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc. The name Monel identifies the natural nickel alloy as produced by The International Nickel Company.

Monel Metal withstands alkalies, high temperatures, most acids, and erosive action of gases and superheated steam. Can be forged, cast, rolled, drawn, machined, brazed, soldered and welded. Takes and retains a perfect nickel finish.

Monel Metal may solve your difficulties—our Technical and Sales Departments will gladly cooperate with you.

The International Nickel Company of Canada, Limited

HARBOR COMMISSION BUILDING

TORONTO, ONT.

INCo MONEL METAL TRADE MARK

INCo NICKEL TRADE MARK

"BUFLOVAK"

Vacuum Drum Dryer

Vacuum Shelf Dryer

Horizontal Tube Evaporator

Vacuum Nitric Still

Nitrator, Hough Type

Whether or not you buy quality---you pay the price just the same

Quality collects its cost in the beginning—in the purchase price. Cheapness collects it in poor service, bother, worry, disappointment—in fact you never get done paying for cheapness.

Careful investigations and use under varying conditions of manufacture have proved time and again the superiority of apparatus bearing the trade names "Buflokast" and "Buflovak." This superiority is not the result of chance, but it is the outcome of painstaking effort, backed by scientific research, experience and ample manufacturing facilities.

We will gladly co-operate in adapting our standard apparatus or developing new apparatus to meet your special requirements.

"BUFLOVAK" AND "BUFLOKAST" PRODUCTS

"Buffovak" Vacuum Dryers.
Drum, shelf and Rotary Types for drying all materials without danger of overheating or other injury.

"Buflovak" Evaporators.
For concentrating solutions and separating solids from liquids.

"Buflokast" Chemical Apparatus.
For producing Heavy Chemicals, Organic Chemicals, Acids, Alkalies, High Explosives, Dyestuffs, etc.

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Including complete plants and refineries.

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ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

Hon. H. Mills, Minister of Mines

In the following table is summarized the mineral output of Ontario for 1919. As far as possible, the quantities represent actual shipments and the values are the returns for products marketed. Figures for 1918 are included for comparison. Tons throughout are short tons of 2,000 lbs.

Ontario, in 1919, produced 38 per cent. of the total mineral output of Canada.

Summary of Mineral Statistics, 1919.

Product.	Quantity.		Value.	
Metallic:	1918.	1919.	1918.	1919.
Gold .....ounces	411,878	505,964	$ 8,502,480	$10,451,709
Silver. . . .. "	17,738,153	11,363,252	17,415,882	12,904,312
Platinum metals ..... "	.....	1,770	.....	200,000
Copper, blister ..... lbs.	1,211,922	5,684,183	270,430	969,024
Copper in matte (a) ..... tons	22,951	9,431	8,262,360	2,740,663
Nickel in matte (a)..... "	44,297	15,581	26,578,200	7,990,403
Iron ore, exported (b)..... "	107,273	5,953	624,364	48,341
Iron, pig (c)..... "	50,072	46,769	1,346,736	1,200,793
Cobalt, metallic ..... lbs.	404,348	121,926	887,960	243,554
Cobalt oxide ..... "	477,583	426,573	727,170	624,553
Nickel oxide ..... "	406	11,817	106	3,762
Nickel, metalic ..... "	3,450,550	11,355,390	1,262,116	3,931,055
Other Nickel compounds .... "	453,515	353,267	73,347	46,711
Other Cobalt compounds..... "		199,487		141,372
Lead, pig ..... "	1,670,251	1,529,987	149,841	94,507
Molybdenite, concentrates ... "	47,614	.....	59,067	.....
Metallic total	.....	.....	$66,178,059	$41,590,759
Non-Metallic:				
Actinolite .....tons	228	160	2,508	1,176
Arsenic, crude and white.....lbs.	5,090,818	5,668,170	566,332	485,360
Barite. . . ..tons	60	.....	900	.....
Clay products—				
Brick, fancy and pressed.....M	25,377	31,738	396,698	539,908
Brick, common .....M	49,498	141,255	665,454	1,966,711
Pottery.	.....	.....	88,275	119,551
Sewer pipe	.....	.....	362,536	609,100
Tile, drain .....M	13,087	13,009	309,899	354,700
Tile, hollow building .....tons	.....	17,435	195,588	184,900
Tile, roofing .....tons	.....	.....	.....	1,692
Cement, Portland .....bbls.	1,226,244	2,022,575	1,910,839	3,659,720
Corundum. . . ..tons	137	.....	26,120	.....
Feldspar ..... "	19,784	14,787	111,173	88,663
Fluorspar ..... "	7,286	3,425	153,190	60,039
Graphite, crude and refined ..... "	2,934	1,340	208,848	99,841
Gypsum, crushed, ground and calcined. . . .. "	38,214	59,899	151,564	278,111
Iron pyrites ..... "	270,966	117,178	1,144,737	366,422
Lime .....bush.	2,650,285	3,911,572	872,177	1,268,290
Mica. . . ..tons	275	567	49,575	56,199
Mineral Water .....Imp. gals.	298,498	276,838	133,808	19,290
Natural Gas .....M. cu. ft	13,075,742	11,085,819	2,498,769	2,583,324
Peat. . .....tons	.....	500	.....	1,750
Petroleum, crude .....Imp. gals.	10,106,615	7,703,515	781,097	632,789
Phosphate (apatite) .....tons	.....	2	.....	31
Quartz (silica) .....tons	213,420	59,658	452,711	179,070
Salt. . . .. "	131,726	148,112	1,287,039	1,395,368
Sand and Gravel.....cu. yds.	1,023,497	1,065,851	553,638	501,666
Sand-lime Brick .....M.	7,941	27,661	91,508	367,815
Stone, building, trap, granite, etc...	.....	.....	869,239	1,230,922
Talc, crude and ground.....tons	17,465	17,571	246,691	240,399
Total non-metallic.....	.....	.....	14,130,913	17,293,157
Add metallic	.....	.....	66,178,059	41,590,759
Grand Total	.....	.....	$80,308,972	$58,883,916

(a) Copper and Nickel in the matte valued at 18 and 30 cents per pound, respectively, in 1918 and at 14 and 25 cents in 1919.

(b) Total shipments of iron ore, 198,882 tons in 1918 and 195,790 in 1919.

(c) Production from Ontario ore only. Total output of blast furnaces, pig iron 751,650 tons, vaued at $20,522,356 in 1918, and 623,586 tons worth $16,010,537 in 1919.

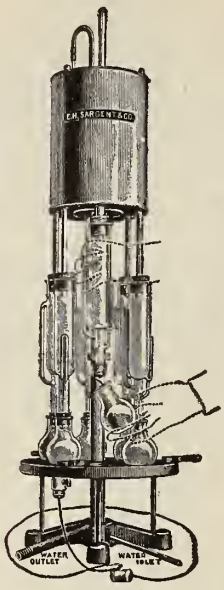
Dividends and Bonuses paid to the end of 1919 amounted to $15,545,238 for gold mining companies, and $78,335,943 for silver mining companies, or a total of $93,881,181.

Publications:

For illustrated reports, geological maps and mining laws, apply to

THOS. W. GIBSON,
DEPUTY MINISTER OF MINES,
TORONTO, ONT.

Sargent's Revolving Extraction Apparatus



Patented

This is the most convenient form of Extraction Apparatus on the market. It occupies only about a square foot of space. May be installed in any out of the way place. May be supplied for any style of glassware. Uses no rubber or other tubes except for inlet and outlet of water. No clamps or supports are necessary. The condensers are self-contained.

When not in use as an Extraction Apparatus, it may be used as a hot plate. May be conveniently placed on a shelf against the wall as all flasks are readily accessible on account of its revolving feature. Any flask may be removed without interfering with the other. Any number of determinations from one to six may be made at one time.

In case of accident the hot plate may be readily removed and replaced by use of a screw driver only.

Made for 110 or 220 volts and may be used interchangeably on alternating or direct current. It is entirely portable and if set up on valuable table space, may be removed and stored with ease when not in use.

Immediate delivery from stock.

Price $70.00 without Glassware

Descriptive Circular furnished upon application.

E. H. SARGENT & CO.

Importers, Makers and Dealers in Chemicals and Chemical Apparatus of High Grade Only

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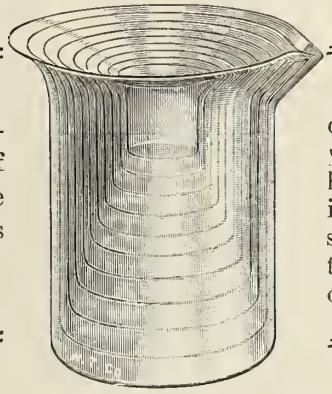
CANADA'S LEADING LABORATORY SUPPLY HOUSE

NONSOL GLASSWARE OVERSTOCK SALE

We are heavily overstocked on some lines of Nonsol Glassware, so have decided to reduce prices by at least **one-third.**



Nonsol Glass has been on the market for many years and while not so heavy as Pyrex, combines in the highest degree resistance to heat and ability to withstand the action of chemical reagents.

	Regular Price.	Sale Price.
Beakers, Griffin's low form with lip—		
250 cc.	$2.80 dozen	$1.85 dozen
350 cc.	3.35 dozen	2.25 dozen
600 cc.	4.65 dozen	3.00 dozen
700 cc.	5.00 dozen	3.25 dozen
1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form with lip—	Regular Price.	Sale Price.
60 cc.	$2.00 dozen	$1.40 dozen
120 cc.	2.35 dozen	1.55 dozen
180 cc.	2.50 dozen	1.65 dozen
1000 cc.	7.50 dozen	5.00 dozen
Beakers, tall form without lip—	Regular Price.	Sale Price.
180 cc.	$2.50 dozen	$1.65 dozen
700 cc.	5.00 dozen	3.25 dozen
Flasks, Erlenmeyer (Conical) narrow mouth—		
	Regular Price.	Sale Price.
500 cc.	$3.25 dozen	$2.25 dozen
700 cc.	4.20 dozen	2.75 dozen
1000 cc.	5.00 dozen	3.25 dozen
2000 cc.	10.00 dozen	6.50 dozen
Flasks, Flat bottom, vial mouth, globular—	Regular Price.	Sale Price.
180 cc.	$2.35 dozen	$1.55 dozen
1000 cc.	4.65 dozen	3.00 dozen
2000 cc.	10.00 dozen	7.50 dozen
4000 cc.	16.60 dozen	10.50 dozen
Flasks, Flat bottom, heavy ring neck, globular—		
	Regular Price.	Sale Price.
250 cc.	$3.35 dozen	$2.25 dozen
500 cc.	3.80 dozen	2.50 dozen
700 cc.	4.25 dozen	2.75 dozen
Flasks, round bottom, vial mouth, globular—	Regular Price.	Sale Price.
1000 cc.	$4.65 dozen	$3.00 dozen
Flasks, Kjeldahl, long neck—	Regular Price.	Sale Price.
800 cc.	$6.00 dozen	$4.00 dozen

All orders will be accepted subject to prior sale.

LYMANS, LIMITED MONTREAL

ARE YOU MAKING ELECTRICITY DO YOUR WORK?

The Electric Nitrogen Distilling Apparatus

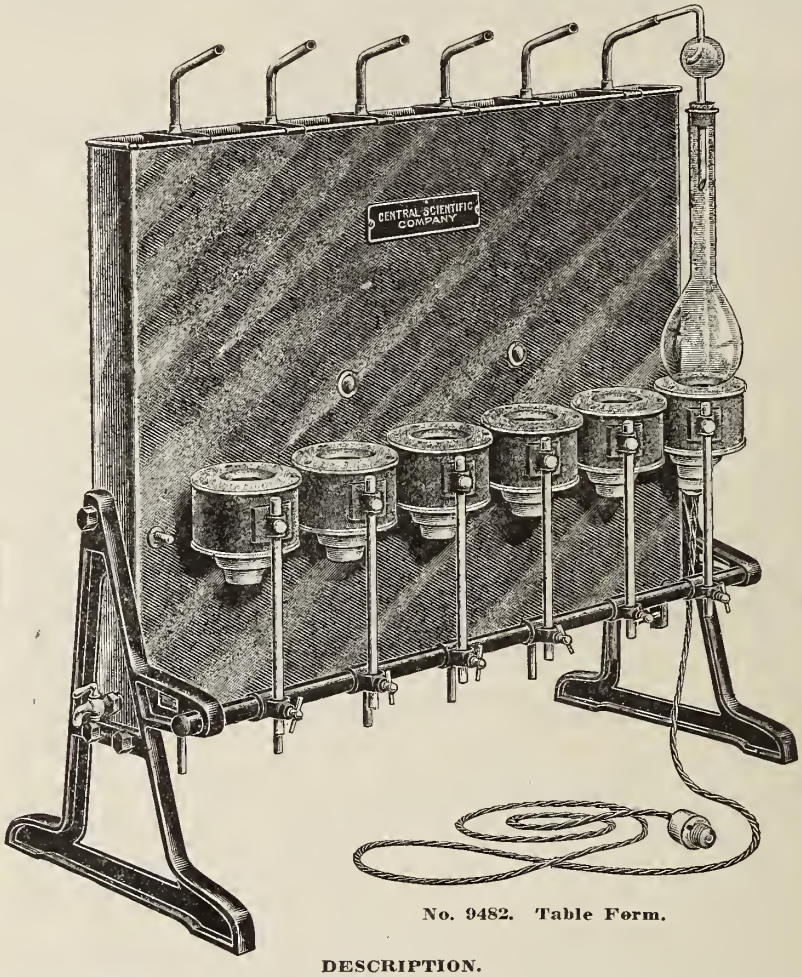
SHOWN HERE

is another one of the numerous applications of electricity, for the convenience of the laboratory worker, which have become associated with the name "Cenco."

Saves Time

Conserves Energy

Preserves Your Temper



Avoids Breakage

Minimizes Fire Hazard

No. 9482. Table Form.

DESCRIPTION.

The heating units are the same as we employ in our No. 9647 Cenco Electric Heater for Gasoline Distillation. They have been demonstrated to be superior in efficiency because of the character of the refractory employed and because of their shape and construction. For these reasons they are very economical in the use of electric current, consuming only 250 watts on 110 volts to distill the ammonia over at the usual rate.

No rheostat is included in the heater, the elements having been wound with the size of wire required to maintain the proper rate of distillation within the limits of voltage fluctuation usually experienced.

The heaters are provided with transite tops with bevelled openings upon which the flask rests and can be lowered to permit removal of the flask. As the flask does not come in direct contact with the heating element, the danger of breakage is reduced to a minimum. In case of breakage of the flask and the spilling of its contents on the heating element, the latter may be removed, rinsed out with water and allowed to dry, when it will be found as serviceable as ever. Each heater is provided with an independent connecting cord, so that any number may be used at one time. The heaters may be removed entirely from the apparatus and used for many other purposes in the laboratory.

We are now making our Nitrogen Distillation Apparatus so that either gas burners or electric heaters may be used, the change from one to the other being readily made.

9481. KJELDAHL DISTILLING APPARATUS
Electrically Heated.

Wall Form (as described above) without supports but with hooks for hanging on the wall.

No.	A	B
For volts	110	220
Each	$160.00	$172.00

9482. KJELDAHL DISTILLING APPARATUS
Electrically Heated.

Table Form, (as described above) without glassware.

No.	A	B
For volts	110	220
Each	$170.00	$182.00

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LABORATORY Apparatus CENTRAL SCIENTIFIC CO CENCO CHICAGO. U.S.A. SUPPLIES Chemicals

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Our organization has a valuable service to offer to you, if you are interested in purchasing Chemical Apparatus.

As our experience in this field has extended over a period of fifteen years, there is scarcely a chemical problem which we have not met and solved.

Our service includes the construction of every type of apparatus for the chemical industry, dye industry or any industry which is chemically controlled.

Our products for these industries include Autoclaves for low or high pressures in any size or capacity desired; Nitrating, Reduction, Sulphonating, Fusion, Color and Tilting Kettles which are constructed from standard designs or to meet special requirements; Columns, Stills, Rectifying Apparatus, Extractors, Digestors, Condensers and Vacuum Pumps.

We also can construct and install complete plants for the manufacture of the following chemical products:—

Benzol, Naphthalene, Anthracene, Anthraquinone, Toluol, Toluidine, Aniline, Dimethylaniline, Diethylaniline, Beta Napthol, Paranitraniline, Phenol, Resorcinol, Salicylic Acid, Acetylsalicylic Acid (Aspirin), Phenylsalicylate (Salol), H-Acid, Gamma Acid, Dianisidine, Tolidine, Benzidine, Acetic Anhydride, Acetanilide, Benzoic Acid and the Benzoates, Benzaldehyde, Sulphur Black, Malachite Green, Violet Blue, Fluorescein, Primuline, Induline, Alizarine, etc., including all the Coal Tar derivatives, the higher intermediate colors and dyestuffs.

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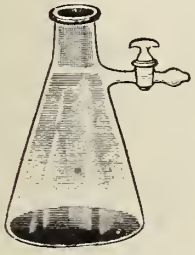
Canada Carbide Company, Limited
MONTREAL, - CANADA

Aspirator Bottles

A product which has been off the market for some years, now obtainable in the styles as illustrated and in the following sizes:

Capacity cc 250, 500, 1000, 2000, 4000, 8000



Filter Flasks

With side neck and glass stop cock. Owing to a large stock of the above flasks in the sizes 500 cc and 1000 cc, we are making these very special prices, viz.:

Capacity 250 cc	Each $2.00	Dozen $21.60
Capacity 500 cc	Each 2.35	Dozen 25.40
Capacity 1000 cc	Each 3.85	Dozen 41.60

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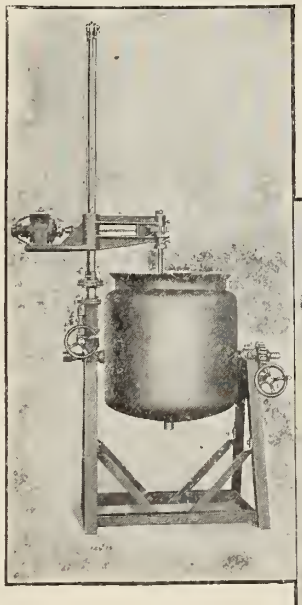

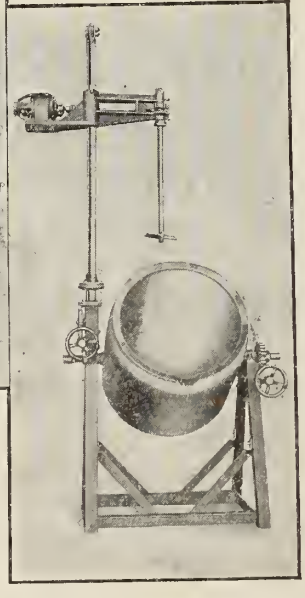

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THESE Kettles are suitable for general mixing purposes and are lined with the famous Pfaudler Acid Resistant Glass Enamel. Tilting is accomplished by operating the hand gear wheel at the right of the kettle. Very accurate control in tilting is made possible with this mechanism.

The agitator can be raised clear of the kettle, whenever tilting is necessary, merely by turning the gear wheel at the left. These kettles are very convenient and practicable in plant operation, and can be furnished in a number of sizes.

The Pfaudler Co., Rochester, N. Y.

The World's Largest Makers of Glass Lined Steel Equipment

New York Chicago St. Louis San Francisco

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	200	100	50	20	10	5	2	1	grams
Error limit + or —	5	2.5	1.5	1	.75	.75	.5	.5	mg.
	500	200	100	50	20	10	5	2	1 mg.
Error limit + or —	.25	.25	.25	.15	.15	.1	.05	.03	.03 mg.

No. 820 **Analytical Weights,** brass, polished and lacquered; fractionals of nickel silver and aluminum. Each weight fitted separately, brass weight holes velvet lined. Complete with forceps in finely polished mahogany box with hinged cover velvet lined.

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No. 822 Identical with **No. 820.** but in mahogany block without the cover.

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The Largest Makers of Coal-Tar Dyes in America

Quality "National" Dyes are not placed on the market until their quality has been finally determined.

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National Aniline and Chemical Co., Inc.

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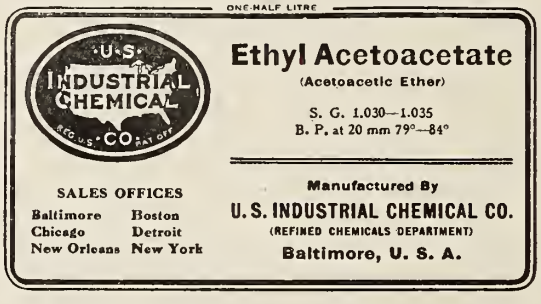

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We now have available the following chemicals:—

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ANHYDROUS ETHYL ACETATE
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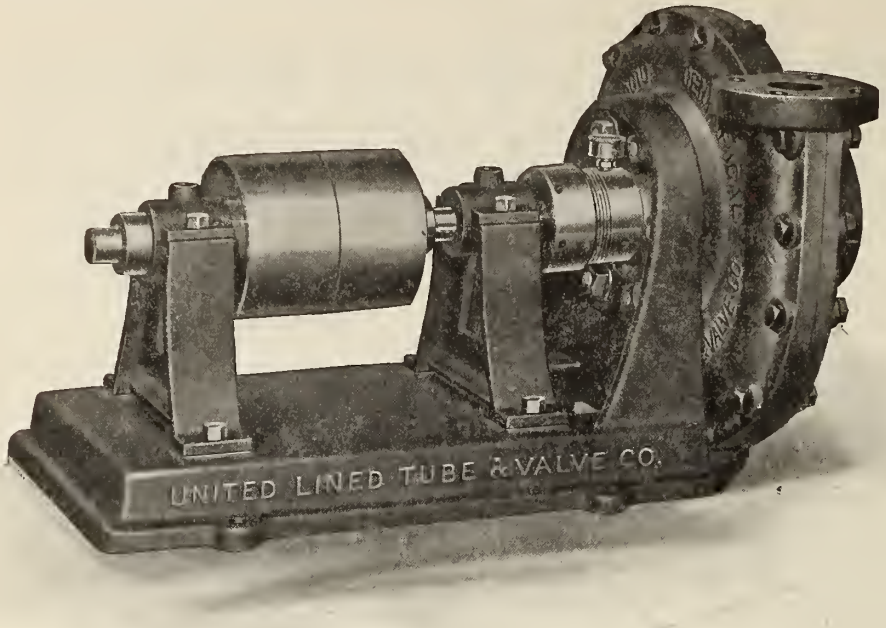

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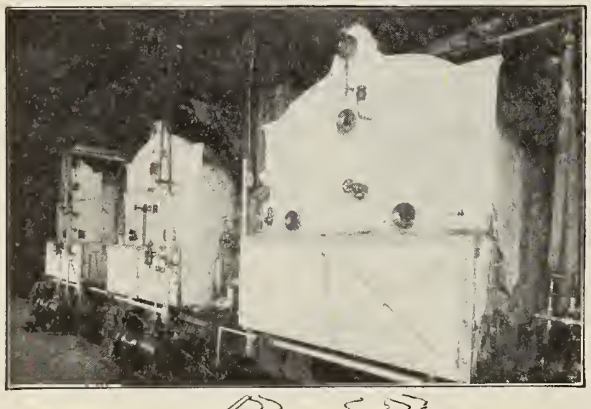

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EDITORIALS

GOOD WILL

STRANGE that 2000 years have gone by since the angels sang the song of all the ages Glory to God in the highest, on earth peace, to men of good will; and we still go to war. No one disputes the statement of the angels, but we all expect the other man to have the extra supply of good will and then when we find one who has, we label him an easy mark and draw on him all we can. The very Prince of Peace said "I came not to bring peace but a sword". Peace cannot come to a world of ill-will without arousing antagonism. No army, navy, treaty, league, tariff, bargain, policy, or system can do more than "have its day and cease to be" unless the element of good-will is present.

Our Christmas wish is that the chemical fraternity may be able to hasten the day when Good Will is exchanged at par throughout the world.

A CANADIAN PLANT--WHY?

INDUSTRIAL Commissioners acting for cities and districts, Railroads, Government Trade Representatives, and more recently Banks, are active agents abroad, all working for a common end, namely, the bringing of industrial plants and population to Canada. Keen rivalry is shown by Canadian districts and cities, although the period is well past when towns were willing to guarantee bonds or put up money for the fly-by-night variety of promoter.

With regard to population, we have problems here as they have in the Western States, and Australia. Asiatic races are striving to enter, but are not welcome for several reasons, and when admitted do not mingle with the children of Europe in America. Over-anxiety to secure population as a thing in itself is to be avoided, and to a large extent necessary measures of selection are operating.

In the field of industrial development, further analysis might be in order. If it be taken as axiomatic that the ideal thing to do here would be for Canadians with their own capital to develop their own resources and industries, and as occasion offers sell finished products abroad, the duty of each individual and company in Canada is plain. It is the general contention that we have insufficient capital to accomplish these ends and that we should invite British and American capital to come to our assistance. This is a doctrine which tends to deter Canadian investors and places too high a premium on the foreign purse. Money from abroad often brings with it executive officers of foreign extraction, which does not always strew the path of native Canadians with roses. This is often overlooked. We do not wish to take a provincial attitude in the matter, but we would like to know of a real opportunity for development in Canada, which is of such magnitude that it could not be accomplished by Canadian money and Canadian brains, if we saw the point as clearly as we should and went at it like a Victory Loan.

If the same amount of energy were expended along lines designed to impress Canadian capital with the possibilities of success in development work at home through reasonable amalgamation, we might progress as fast as we are now doing by our pressing invitations to foreign investors.

There are English plants in Canada and American companies operating here in large numbers. If these are studied carefully, it may be seen that some are not very active in pushing Canadian interests. From the English point of view, it has always been difficult for directors in England to operate successfully in Canada. Canada lacked the invigorating personal touch that came from the head office, and often the Canadian representatives were unable, though willing, to make the enterprise really Canadian. We should not soon forget the attitude of smaller shareholders in the Grand Trunk when negotiations with the Dominion Government were disclosed.

It is well enough to encourage American plants to come to Canada because they may have better access to Empire markets, a preferential tariff, and a close protected touch with Canadian business, but the fruit of all this may amount only to an arrangement with the parent company that the Canadian branch will not compete in foreign business or develop export trade. It is a profitable revenue producer, an asset to Canada, and does keep in touch with Canadian developments, but for participation in exports, it is seldom a factor, whatever else it may become. In general, the business could well be done by Canadians, if they would put their money and thought into it, provided a suitable measure of protection to manufacturing is continued. It should be remembered that competition is real in foreign trade, and not likely to be stimulated by branches of the same house. There are cases where the foreign capital is placed in an industry not tied up to a chain of plants abroad. In such a case, the plant naturally is

not a branch but an independent enterprise, and will react more from the "Canada first" viewpoint.

In the past, many European manufacturers were accustomed to grant agencies for their products in the United States, and throw in Canada for good measure. This should be held up short and quickly. It operates nicely, as far as exchange is concerned, from the European standpoint, but as a good-will builder, it has nothing to recommend it. There is some evidence that the tables might be turned, if Canadians were enterprising enough to develop more British connections and sell in the United States from Canada. If Empire relationships mean anything in business, this would be an opportunity to show it.

We welcome both American and British capital in Canada, and the individuals who may come with the industry, but each branch started is one more indication that Canadians are often just a trifle drowsy, rather than poor, when it comes to starting things in the industrial world.

McGILL CENTENNIAL.

OUR best wishes and congratulations go to McGill University on the result of its campaign for funds to carry on the fine expansive programme, marking its entry on a second century.

Those who have not given the matter much thought are inclined to wonder why such institutions cannot carry on with fees paid by students.

The figures given in the McGill pamphlet settle that point very nicely.

A science student in four years pays $800.00 in fees and his tuition costs $3250.00. A medical student contributes $750.00 in the same time for a course that costs $2870.00. Law students pay $240.00 and receive tuition costing $1320.00, and Arts students get a bargain, paying $240.00 for a four year course costing $2725.00

Two views may be considered in handling this problem. First, it would be suggested, raise the fees; Secondly, and better, if the community now pays four fifths, largely through private benefactions, why could it not make tuition free and pay the other fifth by general levy. All men are not born free and equal, George Washington and Company to the contrary, notwithstanding, but all should have equal opportunity.

The large private benefactions mentioned are often given for the more spectacular object of buildings and equipment, rather than salaries and maintenance. So a splendid equipment may be at times a heavy financial burden.

Two of the objectives in the McGill campaign appeal strongly to us. They are salaries and dormitories. The members of university staffs are in the class of workers whose remuneration lags longest when costs go up. This is one weak spot in our economic system.

The out of town student finds rooms scarce, expensive, and often unsatisfactory. We heard of one, the son of a mill foreman, who came from a small town and is paying nine dollars a week for a room without board. The fact that he is paying more than he needs to, only emphasizes the condition. Good dormitories, well managed should be a paying proposition for maintenance if not for capital.

One thing sometimes lost sight of is that universities are centers for all the forms of investigation that add to national wealth, developing our resources and broadening our national view point.

Generous maintenance and adequate equipment of our universities is a good practical national insurance policy.

TARIFF COGITATIONS

WE take some issue with those who are so politically minded as to believe that a properly constituted tariff commission could not be organized and made sufficiently free from class attack so as to function in the common good. There has been a tremendous amount of talk on the tariff question recently from all angles. Everyone is an extremist. Sweeping statements are met by equally sweeping expressions of conviction. It has been rediscovered that people do not like taxes.

It seems to us simple-minded ones that each item in question could be studied in detail, all economic factors and relationships could be added up, and a pro tem arrangement made which would last just so long as data showed it to be necessary. In this way, the tariff on an item might fluctuate at yearly intervals. For example, it appears that there is an import duty of $3.00 per gallon on butyl alcohol from the United States. Why is this? Why not make it $4—$10—any convenient amount? Revenue should be absolutely secondary to economic considerations in tariff matters. We recently asked Ottawa about this, and were referred to a Chief Collector of Customs. He, of course, never heard of such a thing as butyl alcohol, and for that we have nothing against him. What machinery has ever been used to guide the Government in a special case? Now from the chemical point of view, there should be a tariff commission and a chemist connected with it. In fact, there should be a large commission capable of handling details in its branches and digesting and balancing generalities at the centre. It should

not meet once a decade, but should always be acting.

It has been suggested by some that a tariff high enough to stop completely the importation on some commodities should be adopted and some system of regulating prices in Canada established. Such a scheme or any other must be based on a complicated series of economic factors and the first work is to secure this scientific basis, so that factors designed to regulate human greed and supply revenue may be properly set.

Let us forget generalties until it is time for them and get down to the mat on particular items following their ramifications to some definite conclusion. We hazard the guess that if this were done there would be many changes made in the present rulings, but in the end a moderate measure of protection would be granted unanimously by Canadians. Not having the scientific or industrial data necessary to go on, which we do not believe has ever been properly available for Canada, this must remain a guess. It is enough to have circumstances altering cases without having the circumstances so highly distorted.

AN INSPIRING THOUGHT

IT may now be announced that just previous to the Chemical Exposition in 1921 at New York, joint meetings will be held by Anglo-Saxon Chemical Societies. It is inspiring to think that nearly twenty-five thousand chemists of Anglo-Saxon blood will be represented through their societies.

The Society of Chemical Industry will hold its annual meeting in Montreal during the last week in August. At that time Canadian chemists will gather with their brethren from overseas. After visiting Shawinigan Falls, Ottawa, and possibly one or two other Ontario points, a day will be spent in Toronto. The Canadian National Exhibition will be running, and it is to be hoped that the new Chemical and Metallurgical Section will have sufficient space next year to do full justice to the industries represented, and that it will give the visiting chemists a fair review of the chemical and allied industries of the Dominion. The Niagara peninsula will be visited, and Niagara Falls. Doubtless many Canadian chemists will desire to accompany the party to New York.

It is a good time for this gathering together of those whose vision and language are common. What an answer to all who hope by one means or another to divide the ranks of those who stood together during the years of war. Men of science in the nation must shoulder their responsibilities as leaders and must make their voices felt in the business of national ideals. Canada will welcome British chemists, and together British and Canadian chemists will be made to feel very much at home in the presence of the great chemical fraternities of the United States. This conception of Anglo-Saxon Chemical Unity is an inspiring thought indeed.

STIMULATING LEADERSHIP

HIS Excellency the Governor-General recently opened the season's meetings of the Royal Canadian Institute at Toronto with an address on "Research". It is not the function of the chief representative of the Crown in Canada to deal with public matters on the political plane. Coming at a time when parties in Canada are in the course of reformation, and when our parliaments are having forced upon them some new alignments, no better conception could be put forward than the idea of "research" in the life of the people. At a time also when the restandardizing of commodity prices must be borne by industries and to some extent by everyone individually the optimistic attitude of His Excellency the Duke of Devonshire, based on his knowledge of the powers of applied research should be seriously considered by those who see disintegration only.

It is well indeed that the doctrine of research is being presented by a member of a family whose connections with the development of science in England has been so great and of such long standing. It remains for those in all industries to grasp the conception and foster agencies directed toward such a desired end.

Few are properly acquainted even in a broad way with the resources of Canada, and there are a smaller number who have any concrete conception of the men, money and organization necessary to the full development of our national assets. We need the optimistic viewpoint and the faith to believe that these necessary conceptions will develop in the minds of our elected representatives and our industrial leaders. Not until these ideas culminate in action will the wheels begin to turn more quickly.

SHAWINIGAN SHOWING THE WAY

SHAWINIGAN FALLS is a noted chemical manufacturing centre. This has been again demonstrated by the way they have put through the establishment of a Section of the Society of Chemical Industry. We congratulate the chemists of Shawinigan and their associates on securing such a large initial membership in this society.

It is evident indeed that whenever the relationship of chemistry to industry is shown properly, the membership of the Society of Chemical Industry may be increased and a full measure of the real objects of the Society attained. If the allied business interests will line up with their chemists, good industrial progress will result.

Nitric Acid Production in the Island Arc Furnace

Description of Design, Construction, Operation and Results Obtained in the Production of Nitric Acid by a 65 K. W. Single-Phase Experimental Nitrogen Arc Furnace

By J. S. ISLAND

THE production of nitric acid and nitrogen compounds generally from air nitrogen has been a matter of extreme importance during the past few years, and a variety of furnaces are now in operation or available. Electric power prices and facilities are the limiting factors, and unless the cost of natural nitrate nitrogen is reduced greatly, there will exist many localities where the production of synthetic nitrogen compounds may be carried on best, both from an economic and national standpoint by some type of furnace. Various types of arc furnaces are at present in operation, or have been recently, both in Europe and the United States.

Furnaces at Present in Operation.

In the Pauling furnace the arc is struck between two stationary electrodes. The electrodes diverge in opposite directions at an angle of 45° from the bottom toward the top, and thus give the flames a fan shape. The arc is kept going by starting points which are operated mechanically at the bottom of the electrodes where the air enters through a tube. There are a number of these furnaces in operation at Innisburke in Tyrole, Austria.

The Schonsein and Hersberger furnace is a long vertical iron tube open at the top, which acts as an electrode. An electric arc is made to pass by approaching another insulated electrode to within a few millimetres of the base. If a current of air is now passed into the lower part of the tube in a tangential direction in such a manner that a spiral air current is produced, the flame of the arc increases in length, following the air current, and becomes strongly luminous at the top of the tube. A collecting tube carries off the air which contains the nitric oxide gases. In this arc the contact of the air is on the outside of the flame.

The Birkeland & Eyde furnace was worked out by Dr. Birkeland, of Christiania, and Dr. Samuel Eyde.

In this furnace the arc is struck between two hollow copper electrodes, which are water-cooled. These electrodes approach each other to within one-quarter of an inch, and 3,500 volts used. The arc is blown out into a disc shape by means of a powerful magnet, the lines of force acting at right angles to the arc electrodes. The furnace is made of steel and lined with fire-brick, and is narrow in the direction of the lines of force, being about 1½ inches wide. The disc flame in the large three thousand K.W. furnace is about six feet in diameter. It is not a true disc, as at each alternation of the 50-cycle current the disc is half the circle on top, and then half the circle on the bottom, so that only part of the disc flame comes in contact with the air which is blown through the openings in the fire-brick lining. Alternating current is used on the electrodes, while direct current is furnished the magnets. These magnets consume about 10% of the energy used. The design of this furnace makes it somewhat difficult to suddenly cool the exit gases.

Essentials of Furnace Design.

If, as is generally conceded, the arc process is a thermo dynamic reaction, it appears that the essential conditions in the design of a furnace for the maximum yield of nitric acid per K.W. year are: (1) To mix the air intimately with the arc (to have it enter the central zone) for in the electric flame, as in the gas flame, there are three zones; however, in the electric flame the inner zone is the hottest. (2) To have the gases removed as rapidly as possible. (3) To have the gases cooled to at least 600° as quickly as possible, as the reaction is reversible.

In the Island furnace the gases are intimately mixed with the arc, and are removed and cooled faster than in any other design of furnace.

Final Report of Nitrogen Products Committee.

In this report it is stated that the arc process with electrical energy at £3.75 ($18.28¼) per K.W. year could produce concentrated (93%-96%) nitric acid at a cost at the factory of £11.5 ($56.06¼) per metric ton (2205 lbs.) of nitric acid (calculated at 100%) or about half the cost by the Chile Nitrate Retort Process, namely, £22.3 ($108.71¼) per metric ton of nitric acid. For every additional £1 ($4.87½) per K.W. year in the cost of electrical energy, the production costs by the arc process would be increased by £1.87 per metric ton of nitric acid. As long as the cost of energy is below £9 (43.87½) per K.W. year, the process (even when allowance is made for interest at the rate of 5% upon the heavy capital cost of the arc furnace installation) would stand to advantage as compared with the retort process. The above calculations are figured at 61 grams HNO_3 per K.W. hour.

In the case of nitrate of lime and sodium nitrate, the arc process, with cheap water-power, is the only process that shows sufficient commercial margin to enable the synthetic product to face a substantial lowering in the pre-war price of Chile nitrate, although the ammonia oxidation process lends itself to the production of these nitrates at a reasonably low cost if sufficiently cheap ammonia is available, the economic position of the process would be materially affected if the market price of the Chile nitrate fell below its pre-war value.

With cheap power, the arc process can easily compete with any of the others, but is handicapped by the heavy capital outlay required.

A moderate improvement in the yield for the energy consumed, coupled with a reduction in the present cost of generating electricity in coal-fired stations, would place the process in a strong position, even for a country like Great Britain.

The Island Furnace.

In Fig. I. a part section of the furnace is shown. The reaction chamber, which is about 12″ x 12″ x 36″, is lined with fire-brick, the top of which is covered with a fire-brick slab. The whole chamber is insulated from the cement floor by three rows of Kieselguhr brick 2½″ thick. This Kieselguhr brick extends up over the sides and the top of the whole chamber, giving good heat insulation. The fire-brick lining is cemented with a sodium silicate cement and

*Final Report Nitrogen Products Committee, British Government, pp. 46, 87 and 53.

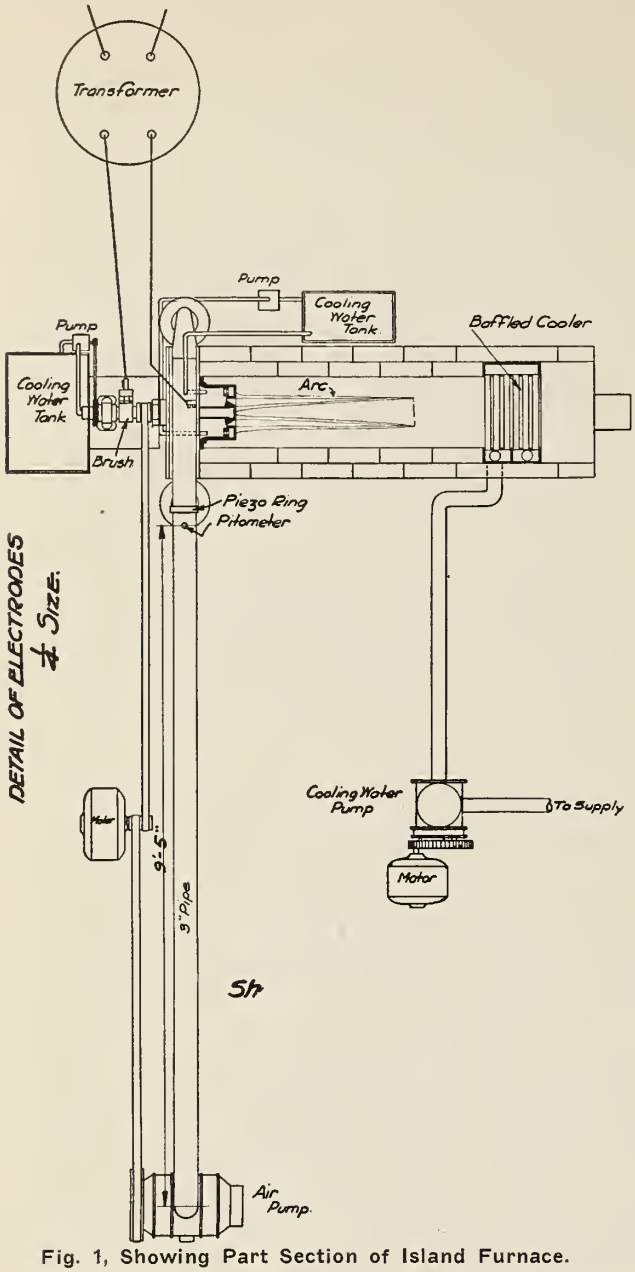

Fig. 1, Showing Part Section of Island Furnace.

the Kieselguhr bricks are laid in Kieselguhr powder and water.

The whole is held together with iron rods and stays. This lining and cover extends over the Baffeled cooler. Back of the Baffeled cooler is a gas chamber where the exit gases enter the exit pipe and where gas samples are drawn off. The Baffeled cooler was made with two heads, having the pipes staggered. The water enters at the bottom of the front end and leaves the cooler at the rear and top end.

The cooling water to the Baffeled cooler was supplied through a 2-inch iron pipe from an ordinary gear pump directly connected to a motor.

At the front end of the reaction chamber and connected thereto is the air chamber which is circular in form, 18 inches diameter and 3½ inches wide, made of ½ inch cast iron and insulated on two heavy porcelain insulators. The air to the furnace is delivered to this chamber through an ordinary 3-inch iron pipe from a Connersville rotary positive blower. Attached to the air chamber casting and extending into the reaction chamber is the outer brass cast circular electrodes.

The stationary electrode is a hollow casting, circular in form, attached to a cast-iron form, which is slipped on to the inner wall of the air chamber casting, and is easily removed when required. This is the outer electrode. The electrode is water-cooled from an insulated water tank, and the cooling water circulated by a small gear pump. The revolving electrode is 2½ inches in diameter, and is carried on a hollow shelby steel shaft which is insulated with a porcelain collar from the iron casting of the air chamber. This collar also acted as one of the bearings. The other bearing was insulated on a cast-iron plate carried by four porcelain insulators, which were carried on a movable carriage.

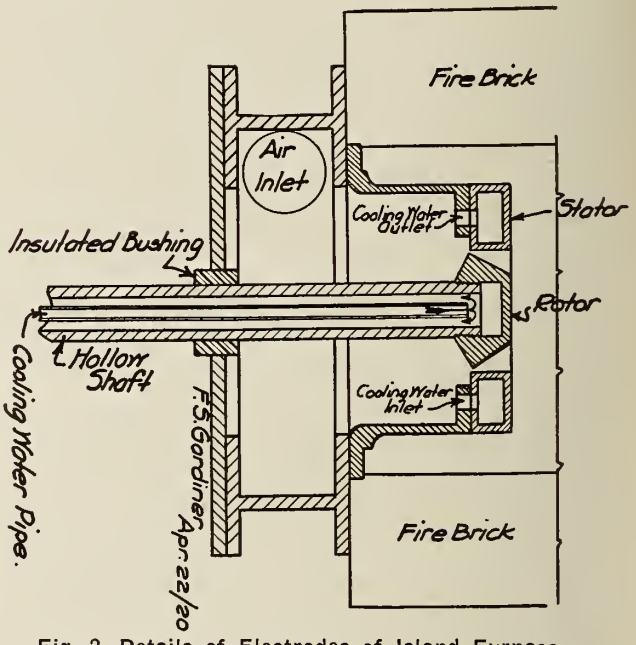

Fig. 2, Details of Electrodes of Island Furnace.

The revolving electrode has four starting points, as shown in Fig. 2. These points come within three-sixteenths of an inch ($\frac{3}{16}$") of the inner wall of the outer electrode, the faces of the two electrodes being in the same plane.

The revolving electrode is water-cooled by means of an iron pipe extending through the hollow shaft to the electrode, the water entering the iron pipe and returning between the outer wall of the intake pipe and the inner wall of the shelby steel shaft. This water is circulated by means of a small gear pump driven from the electrode shaft. The cooling water tank supplying this electrode is insulated and carried on the same carriage as the revolving electrode.

The shaft carrying the revolving electrode is driven by a belt from the same motor used in driving the Connersville blower, as shown in the plan showing part section of furnace.

The size of both the water-cooling tanks is 18" x 13" x 12", and the tanks are made of galvanized iron.

In Fig. 3 the method of insulation of the revolving electrode on the carriage is shown, and also of the position of the cooling tank. The peep-holes are made of pure transparent silica. Here the heating element of the pyrometer is inserted. In designing a large furnace it would not be necessary to insulate water-cooling tanks as the water could be supplied with sufficient length of rubber tubing, as is the usual modern practice.

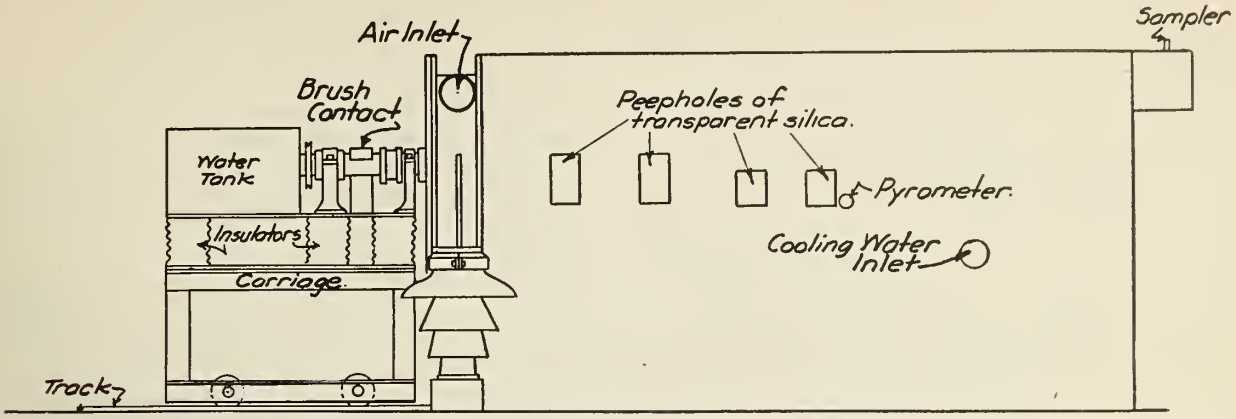

Fig 3, Method of Insulation of Revolving Electrode on the Carriage in the Island Furnace.

Operation of the Furnace.

The principle upon which the Island Arc Furnace depends is the formation of a double tubular arc formed between two hollow circular electrodes and extending into a reaction chamber; a stationary outer electrode and a central revolving electrode, the arc being started by four or more starting points, as shown. It might be pointed out that these starting points do not burn away since the arc extends from the faces of the electrodes, as shown.

The revolving electrode is water-cooled by means of a small gear pump from a small tank installed on the moveable carriage. The water is driven through a one-inch pipe which extends to within a quarter of an inch of the end of the electrode which is carried on a hollow shaft, the water returning to the tank around the outside of the delivery pipe and the inner wall of the hollow shaft, as shown. The stationary electrode is water-cooled by means of a small gear pump, same as the one used to cool the revolving electrode. The tank is also insulated, the water being delivered at the bottom of the stator and returned to the tank from the top of the electrode.

The air chamber is an iron casting approximately eighteen inches in diameter (round) and approximately five inches wide. The stationary electrode is attached to face of the casting toward the reaction chamber and extends into the reaction chamber. The air passes between the inner surface of the stationary electrode and the outer surface of the revolving electrodes and is thus paned through the tubular formed arc which is approximately three feet in length.

The energy is supplied to the furnace from a 400 K.W., three-phase alternator, 2200 volts. The generator is driven by a water-wheel. The power house is situated about four hundred feet from the furnace building. The current is transmitted from the power house from one phase of the generator to a step-up transformer, the starting voltage being six thousand volts. An oil switch is situated between the generator and the transformer.

In starting the furnace the revolving electrode is started together with the air and water-cooling operator. The switch is then closed, the arc crossing at 6,000 volts then drops to about 800 volts with about 80 to 85 amperes, and the arc burns quietly. No reaction coil is used The furnace has a power factor between .87 and .90. The gases from the arc enter a cooler and pass into a mixing chamber and the arc then led outside through a galvanized iron pipe.

Water is passed through the cooler, which is insulated from the electrodes, at a definite rate, the rise in temperature of the cooling water being about 10° C.

The gases entering the cooler are approximately 620° C., and after passing through the centre arc about 260° C., where the sample is taken.

Determination of Output of Furnace.

For the measurement of the air quantity the Pitot-tube method was used and checked by the orifice method and the calorimetric method.

The Pitot tube used was one-quarter inch outer and one-eighth inch inner tubes four inches long. The outer tube was perforated with two small smooth holes on each side, .02 inch diameter. The outer and inner tubes were connected one to each leg of a differential gauge. The gauge used was a U-tube five-eighths inch in diameter and six inches long, of glass, the inner tube of the Pitot tube receiving the impact pressure and the space between the outer and inner tubes receiving the static pressure. The difference between the impact pressure and the static pressure is the velocity pressure. The static pressure is neutralized and only the velocity pressure is registered on the draft gauge.

$$\text{Velocity formula } V = \sqrt{2g\,H}$$

When $g = 32.16$ and $H =$ height, in feet, of column of gas that produces the velocity, $V =$ feet per second.

$$H = \frac{h}{12} \times \frac{\text{density of gauging liquid}}{\text{density of air in pipe}}$$ where $h =$ gauge reading in inches.

or

$$H = \frac{h}{12} \times \frac{\text{Sp. gravity of gauge liquid} \times 1000}{\text{Weight of liter of air at temp. and pressure of room}}$$

The average velocity in the pipe was found by dividing the pipe into equal areas, as follows:

A factor for the velocity at the centre of the pipe was found by taking stations or points corresponding to equal areas horizontally and vertically as:

Station No. 1 = .0236 D	Station No. 6 = .658 D
Station No. 2 = .0817 D	Station No. 7 = .774 D
Station No. 3 = .146 D	Station No. 8 = .854 D
Station No. 4 = .226 D	Station No. 9 = .918 D
Station No. 5 = .342 D	Station No. 10 = .974 D

The square of the average of the square roots of the differential gauge readings represents the gauge reading at the point of main velocity. The factor for the velocity at the centre of the pipe was found to be .92. Then the average velocity multiplied by the area in square feet = volume

in cubic feet. This quantity was found to be 102 cubic feet per minute corrected for temperature and pressure, corresponding to 1.57 cubic feet per K.W.

In the orifice method the following formula was used:

$$W = 0.163 d^2 \sqrt{\frac{hp}{t}}$$

and d = diameter of orifice
where W = pounds per second
h = gauge pressure.

In the calormetric method the following formula was used:

Where W = weight of air passing in a given time.
Ww = weight of water passing in same time.
T_1T_2 = initial and final temperature of gas.
$t_1—t_2$ = initial and final temperature of water.
Cp = specific heat of the gas at const. pressure.
Then

$$W = \frac{Ww\ (t_1 - t_2)}{Cp\ (T_1 - T_2)}$$

The three methods checked up well.

Gas Samples.

Two methods are used, volumetric and gravemetric.

In the volumetric, two bottles of approximately 2,150 c.c. with two ground tubular stoppers, one at centre top and one close to the bottom on the side of the bottle. Each ground glass tubular stopper has a ground glass stopcock made therewith. A good vacuum grease was used and the bottles exhausted by a good vacuum pump with a manometer attached and in every case the manometer reading noted. The bottle was then connected to the gas sampling tube, which was passed through the case at the gas outlet at the back of the furnace, the valve opened and the gas sucked in. The upper valve was then opened, the gas allowed to pass through for ten minutes, then the upper stopper closed and allowed to stand for one minute, then the lower valve closed and the bottle removed. Two samples were taken each time. Ten c.c. of a one-tenth normal solution of potassium hydroxide run in, from a burette, to each sample bottle. The sample bottles were then well shaken and allowed to stand in a water bath till bottles reached the temperature of the water baths and the mist subsided. The sample bottles were then equalized with an equalizing bottle of distilled water. The temperature of the water bath then noted and the barometric pressure also noted.

The sample bottles were then well shaken and the upper stopper removed. Two drops of methyl red indicator were introduced into each bottle and well shaken. The bottles were then titrated back to neutrality with a .1 normal solution of HNO_3. It may be here noted that the standard solutions may not be exactly .1 N; however, the relation of the standard KOH to that of the HNO_3 must be exactly determined. The difference between the original amount of alkali added and the amount remaining gives the total alkali neutralized by the furnace gases in the sample. The liquid in the sample bottles is measured, after deducting the back litre from the measured amount, and, substracted from the total capacity of the bottle. The difference is the quantity of gas actually drawn in at the temperature and pressure noted. This quantity is then reduced to normal temperature and pressure. As all calculations are made at normal temperature and pressure, the percentage of HNO_3 is then easily calculated. Then, knowing the total quantity of air passed through the furnace in one hour, the total grams of HNO_3 produced is calculated. Therefore, the total grams of NHO_3, divided by the K.W. per hour gives the quantity of HNO_3 per K.W.H.

The Gravemetric Method.

Glass vacuum bulbs of 500-600 c.c. capacity and weighing from 60-80 grams were used.

Two samples being always taken, one bulb of approximately the same size should be hung on the opposite beam as a correction for buoyancy, when weighing the bulbs. Each bulb has a ground glass stopper with a ground glass stopper attached. A good vacuum stop grease should be used on all ground joints.

After cleaning the bulbs with a cleaning solution, such as H_2SO_4 containing $K_2Cr_2O_7$, rinse well with distilled water. Add 10 c.c. water and one drop of methyl red indicator (to make sure of neutrality). Then evacuate. (A high vacuum not necessary). Weigh each bulb setting to one side with stopper turned down. This will indicate a leak, should any occur, since air bubbles will pass through the water contained in the bulb should there be a leak. It is always understood that joints are well greased.

Each bulb is weighed again before the sample is taken. Should no leak be indicated, the samples of gas are drawn off and again set, and with stopper turned down.

Should no leak be indicated after five minutes the gas samples are now weighed. The difference between the first and second weights indicates the total weight of gas sample.

Ten c.c. of .1 N KOH is now run in and the bulbs well shaken. After all mist has subsided the sample is then titrated back with .1 N HNO_3 solution, using one drop of methyl red indicator. The difference between the total KOH run in and the amount remaining indicates the total caustic neutralized by the furnace gases in sample. The percentage is then calculated. Knowing the percentage in sample, the total weight of air per hour, and the K.W. consumed, it is easy to determine the grams per K.W.H.

The two methods checked very closely. However, very careful manipulation is required, as a slight leak in either method will give low results. The writer has found a difference of 76 to 88 grams. Some weeks results would run from 82 to 93 grams per K.W.H., and again from 74.4 to 84 grams per K.W.H., and under favorable conditions 93 to 103 grams per K.W.H.

Capt. G. H. Perley, of the University of New Hampshire, U.S.A., using the gravemetric method, obtained 66 to 80 grams per K.W.H. The temperature was very much lower when his tests were made. It might be stated, also, that he based his calculations on the quantity of air as taken by myself with the pitot tube method.

Tests run by Professor J. T. Burt-Gerrans, University of Toronto, showed results ranging from 68 to 85.6 grams HNO_3 per K.W.H. In one run Professor Burt-Gerrans and myself made determinations. I used the volumetric method and Professor Burt-Gerrans used the Devarda alloy method. His result was 85.7 grams HNO_3 and my own 85 grams HNO_3 per K.W.H. Other independent tests gave results of the same order and never fell below the minimum above.

It is difficult to determine the cause of the wide differences in results, and a further study of the distribution of the air, shape of the arc and temperature gradients may well reveal variable factors sufficient to account for some of the fluctuations within limits observed. However, faulty manipulation is certainly one factor, and another cause is, undoubtedly, weather conditions. I am satisfied the average result of the small furnace will be 85 to 90 grams per K.W.H., and with a larger unit results ought to improve materially.

The power was measured by two integrating watt meters, one used to check the other, and apparent energy was taken by an ammeter and a voltmeter tested and sealed by the Canadian Westinghouse Company. The temperature of the gases entering cooler were taken by a good standard pyrometer.

It might be pointed out that electrodes are very easily changed, the revolving electrode being on a movable carriage which runs back and the electrode screwed off and replaced in a few seconds. The stationary electrode is held in place on a form by two bolts which makes it very easily removed. Only ordinary brass castings are used, some of which last four days' running.

Light, Heat and Power

Fuel from Oil Yielding Shale---Conditions in the Scotch Industry Compared with Canadian Conditions---Scotch Retort Not Suitable for Canadian Use.

By LOUIS SIMPSON*

THE importance to Canada of a reasonably priced, yet efficient Fuel, in constant and assured supply, justifies attention being given to the possibilities of Oil Yielding Shales.

There is much contention as to the source from which the Kerogen, the material in the shale that yields oil, comes. Some claim that Kerogen is the remains of vegetable and other life that years ago became enclosed in the sediment that eventually became the shale of to-day. Others claim that Kerogen is simply solidified oil. Although it is interesting and useful to know the source of the Kerogen, it is much more important that Kerogen be present in the shale in quantity, and that the oil educed therefrom will be of a quality that is marketable.

Kerogen, when the shale is subjected to heat in a closed chamber, vaporizes in the form of incondensible and condensible gases; the latter upon condensation become the crude oil of commerce, whilst the incondensible gases are used for fuel. It is a good business to so arrange that these incondensible gases shall, upon combustion, provide heat sufficient, under efficient arrangements, to generate the steam required to produce the power and heat called for by the industry. Local conditions influence this part of the problem, but it would appear that, under certain conditions often present, it would not be good business to produce incondensible gases in a quantity so small that it would become necessary to purchase coal fuel.

Besides these hydrocarbon gases, a certain quantity of ammonia gases are evolved, but unless the temperature to which the shale is subjected is increased greatly over that required for the eduction of the oil, and unless steam be also present, the percentage of the contained nitrogen, recovered as ammonia, will be small.

Scotch Retort Not Suitable For Canadian Use.

In Scotland, in the past, conditions existed that called for as large a return as possible of ammonia. There has consequently been evolved in that country a retort which the writer has dubbed the "Dual Purpose Retort." Like all dual purpose machines, this retort is a compromise as to results between a lessened production of oil (accompanied by an increased production of fuel gas), and a largely increased possible production of ammonia.

In an article published in "Chemical and Metallurgical Engineering," the writer has dealt at length with this aspect of the question, so it is not necessary to restate the facts and figures there given. As certain parties persist in advising the use of the Scotch Retort for the eduction of oil yielding shales found on this continent, and as the use of such a retort in Canada would be fatal to the establishment of the industry, this article will briefly state reasons showing why the Scotch "Dual Purpose Retort" is not the perfected machine the public have been asked to believe, but, on the other hand, is a most uneconomic machine, when operated under the conditions that exist in Canada and upon the American continent.

In Scotland, when the shale is mined, the "fines" produced are left in the mine. "Fines" cannot be retorted in the Scotch Retort without danger of serious trouble. But these hitherto wasted "fines" can be used to advantage when attempts are not made to carry on two distinct operations in one combined machine.

The proper crushing of the shale is of more importance than has been admitted in Scotland, as anyone who has made a study of aggregates and of voids will admit. The Scotch system of passing the shale, after crushing, direct to the retort, even if suitable under Scotch conditions, would be most unsuitable under certain conditions known to exist in Canada.

The Scotch use an intermittent feed, being obliged so to do because of the method primarily employed by them for heating the shale, which method endangers the operations by causing the shale to burn, if rich, onto the inner overheated sides of the retort. Intermittent feed is not economic, as it reduces the throughput. The Scotch also use an intermittent discharge, to which similar objections may be made. The Scotch method of heating the shale has of late years been modified. Originally the whole of the heat required came from the combustion chamber that surrounds the retorts, having to pass through the thick iron walls of the retort. Latterly, since the recovery of the nitrogen contents, in the form of ammonia, has become the primary importance, the heat so previously obtained has been supplemented by heat from the fireclay section of the retort plant, the section in which the nitrogen recovery is undertaken.

The original method was and is open to serious objections, such as:

(1) It is very inefficient in the combustion of the fuel used.

(2) It is very wasteful of heat through losses by radiation.

(3) The control is dependent upon the human factor—as in Canada "green" help would have to be employed, the results will be obvious.

(4) As at present operated, there is also a great waste of steam, which also means a waste of heat.

Besides the leakages noted that have to do with operating the retorts in the Scotch works, there is an enormous

*A second article by Mr. Simpson on the development of an oil shale industry in Canada.

waste of heat in the gas condensers, where all the heat carried off from the retorts by the educed gases and by the steam admitted to the retorts is wasted, when they are cooled in the air cooled condensers.

These wastes may not have been serious items in Scotland before the war, when boiler coal fuel could be purchased at low cost, but to-day and in Canada such wastes could not be endured for one moment. Before the war, in Scotland, one large concern was using 380 lbs. of coal fuel to each ton of shale retorted, whilst the average of several other concerns was 168 lbs. At the present cost of coal in Canada, such consumption of coal is alone sufficient to condemn the Scotch Retort. The Scotch Retort may be described as follows: A round or oval iron retort, about 11 feet high and 24 inches in diameter at the top, enlarging to 28 inches in diameter at the bottom, is superimposed upon a retort constructed of fireclay bricks or blocks, which is about 20 feet high and 36 inches in diameter at the bottom. The whole is enclosed by a combustion chamber, also constructed of fire-bricks. This construction requires many special shapes and sizes and such construction is very expensive when undertaken in Canada. The oil gases are supposed to be educed in the upper or iron section. Incondensible hydrocarbon gases, or else producer gases, are burned at the bottom of the combustion chamber, and the products of combustion pass up the chamber and into the air through small chimneys, that are built from the chamber above the retort.

Conditions are such that the economy of combustion is the last matter for serious consideration, consequently the result, so far as combustion is concerned, must of necessity be inefficient. The attendants main objective is to secure a large percentage recovery of nitrogen, and to obtain this requires very considerable heat in the fireclay section of the retort.

Scotch System of Retorting.

To visualize the application of the heat to the shale, remembering that to educe the oil gases it is necessary to subject each particle of each piece of shale to a temperature higher than 750°F., and that to make a fair recovery of nitrogen each particle of each piece of shale has to be subjected to a temperature higher than 1450°F., it is necessary to consider the retort prior to the time when nitrogen recovery, in the form of ammonia, was added to oil recovery.

The broken up pieces of shale were placed within the retort; the heat was applied, which quickly caused the replacement of the air at first present in the voids by incondensible hydrocarbon gases, which eventually become replaced by gas being a mixture of the incondensible and of the oil gases.

Certain of the pieces of shale, those resting against the heated internal sides of the retort, would very soon reach the required temperature, whilst the pieces not so resting would experience but slight change in temperature. To heat the pieces located in the centre of the retort would necessitate having the pieces located between the centre and the walls heated to a temperature much higher than is desirable. The heat given off by the walls of the retort passes by conduction from the walls to such pieces of shale as rest against the walls, with the sure result, if the shale be rich in oil that these pieces are burned on to the walls of the retort. The heat also passes to the gases that fill the spaces between the several pieces of shale, and it is chiefly through conduction, using these gases as a medium, that the heat eventually reaches and heats up the shale located in the centre of the retort. Circulation of these gases expedites the heating up of the charge, and to some extent minimizes the over heating of the shale located at or near the walls.

It should, however, be noted that the mixed gases that fill the spaces between the pieces of shales must of necessity reach a temperature higher than the temperature required for eduction in the centre of each piece of shale, and that the temperature will be considerably higher near the walls of the retort than it will be in the centre.

To make matters more complicated, the educed gases were in all cases passed out of the retort at or near the top, where the walls of the retort and the shale within the retort were at the lowest temperatures, and when passing through this relatively cold shale the heavier gases were condensed back into oil and so once again had to be subjected to the necessary heat of eduction, as the shale passed downwards.

With the addition of the fireclay section for the recovery of nitrogen as ammonia, and the passing of the heat therein accumulated the result of the passing of the superheated steam up into and through the upper section, came the following benefits:

(1) A supply of heat that does not come from the sides of the retort, but from the bottom, passing up through the load within the retort, equalizing the heat within the retort.

(2) A great increase in the circulation of the gases within the retort, causing a more efficient transference of heat obtained through the heated walls of the retort.

(3) The quicker removal of the educed gases, consequently a reduction in the undesirable "cracking."

There is no doubt that the addition of the fireclay section was an improvement, the pity is that the reasons that necessitated such an improvement were not thought out and carried to their logical conclusion. As operated to-day, when a large yield of ammonia is desired, the operator stands ever between the "devil and the deep sea," for to increase the yield of the ammonia he has to injure the oil recovery.

Separate Processes Desirable.

By separating the two processes, by retorting the shale in a retort specially constructed and operated for the most desirable oil eduction, and then by roasting the waste shale in the presence of steam in a machine specially designed for that purpose, higher yields of both oil and ammonia are possible, and the eventual costs will be reduced. The eduction of the oil contents by the use of preheated incondensible gases is herein plainly indicated, and those high temperature gas engineers, who have criticized adversely such an arrangement upon the score of possible explosions, have indicated that they knew not whereof they spoke. By the introduction of preheated gases if properly introduced, the temperature of the gases within the retort will be sensibly lowered and will be less than that of the gases found within the retort operated under Scotch conditions.

The whole secret in economic retorting is the economic application of heat to the shale, under conditions that ensure the quick removal of the educed oil gases.

In the Scotch system to-day, the gases found within the retort consist of (1) Oil Gases; (2) Incondensible Gas; (3) Ammonia; (4) Steam.

When using only preheated incondensible gas, the ammonia and the steam are replaced by incondensible gas, and such a replacement will reduce the eduction point of the volatile contents of the shale.

The recovery of the nitrogen in the Scotch Retort ranges from 50% to 60%, this could probably be increased to 75% or over were the recovery to be attempted in kilns specially designed for the work. This machinery also would cost much less per ton throughput than the Scotch Retort would cost in Scotland, where the special machinery and parts required are made, and very much less than it would cost to import the special machinery and parts and erect them in this country.

It appears likely that the retort question will be settled at an early date, and when settled Eastern Canada will rejoice in a new fuel industry that, besides other benefits, will provide for the manufacturers of Eastern Canada a reliable source of concentrated fuel.

As low temperature retorting is a novelty in Canada it is necessary to caution those seeking information not to seek such information from high temperature gas engineers, unless assured that these engineers have also made a study of low temperature work. The difference in the practice of high and of low temperature gas engineers is so marked, and the danger is so great that the high temperature engineer, who has given no attention or study to low temperature work, in order not to admit his ignorance, may give opinions upon questions of which he has no knowledge, that this warning is very necessary. Already great damage has been done to this new but much desired industry by the interference of those who have but small knowledge of the many engineering and chemical questions that have to be carefully thought out and adapted to conditions they knew nothing about.

RELEASE RADIUM FOR CANCER TREATMENT.

So great is the demand for radium in the treatment of cancer and various malignant diseases, that a movement is now on foot for withdrawing it as much as possible from the manufacture of luminous dials and other industrial purposes, so that it may be employed entirely for the treatment of human ills.

How this is being effected was described by Dr. Harlan S. Miner, Philadelphia chemist, in an address to the Eastern Section of the American Chemical Society at Union College, Philadelphia.

The substance advocated as a substitute is meso-thorium, a by-product obtained in the manufacture of thorium, which latter is, as is well known, extensively used in the manufacture of gas mantles. The ores from which thorium is made are imported largely from Brazil and India, although there is a limited supply available in the United States. Meso-thorium can be seen at night and, therefore, is an ingredient of the paint which is used in the marking of clock faces, watch dials and range finders which can be read in the dark. The demand for such appliances in the trenches during the European war greatly stimulated their manufacture both in America and abroad, and although they are no longer military necessities they have an extensive vogue in these days of peace.

Thorium is itself radio-active, but is chiefly valuable because when mixed with one or two per cent. of cerium oxide and heated it gives out a powerful radiance. Its use is increasing because municipalities are accepting a heat unit rather than a candle power standard for illuminating gas, and the demand for mantles is likely to extend. Consequently the facilities for making the by-product meso-thorium, which would not be commercially practical of itself, are being augmented.

"Companies which are now manufacturing thorium," said Dr. Miner, "have ever since 1914 been developing their outputs of meso-thorium, and there has been special activity along those lines in the last few months. The demand for radium in the treatment of cancer, and for other medical purposes, is now so great that both physicians and chemists feel that everything possible should be done to conserve it exclusively for therapeutic purposes. If radium is kept in the large hospitals and sanitaria for the relief of malignant diseases, it naturally will be held intact. The losses from its emanations are so slight that it can be used for centuries without any appreciable diminution in its properties. As everything is being done by the medical profession to concentrate the supply in this way, the consensus is that it should be held where it will do the most service to humanity.

"If various forms of radium are employed in the manufacture of luminous paint and for other mechanical purposes, there will naturally be a heavy loss of the element. Watches, clocks or penknives on which radium is used are likely to be lost, mislaid or destroyed, when the supply of the element becomes so widely distributed that the chances for recovering it would be slight.

"It happens, however, that there are also manufacturers of luminous materials who are in a position to derive both radium and meso-thorium from certain minerals, and they are inclined to set aside their radium for medical purposes and to use the meso-thorium, which is chemically identified with radium, as a luminous material. Although there has been some difference of opinion in the medical profession as to the value of radium in the treatment of maladies, there is much to indicate that it and radio-active substances generally have an important part in the practice of the healing art."

HUDSON'S BAY COMPANY RESEARCH FELLOWSHIP.

The Hudson's Bay Company, oldest and most famous of the British chartered companies, as one means of celebrating the 250th anniversary of its foundation and its long connection with Western Canada and with Winnipeg, recently offered the University of Manitoba a Fellowship of the annual value of $1,500 for the years 1920-29 inclusive. This Fellowship, which the University has gratefully accepted, will be called the Hudson's Bay Company Research Fellowship, and is open to graduates of any Canadian university. It is tenable at the University of Manitoba, and each Fellow must devote his entire time to original research in some branch of pure or applied science (i.e., the natural and physical sciences, the medical sciences, engineering and agriculture). Each Fellow will be appointed for one year, and the first appointment will be made at an early date.

The Company, who are to be congratulated for their creation of this important research benefaction, and the University of Manitoba hope in this way to help to create a body of trained investigators who will help to solve the many problems which exist and are arising in the Canadian West.

TORONTO LABORATORY SUPPLY HOUSE MOVES.

Canadian Laboratory Supplies, Ltd., Toronto, have moved from 615 Yonge Street to new and larger premises at 439 King Street West, corner of Spadina Avenue and King Street. In their new quarters much larger stocks will be carried. This is a step forward on the part of this Canadian concern, which reflects the progress being made in Canadian chemical and metallurgical industries.

Gum Arabic, Its Collection, Marketing, and Chemical Characteristics

An Outline of Methods Used in Classifying Gums, Determining Viscosity, with a Review of Theories of Formation and Experimental Work Designed to Measure Yield

By J. A. RIDGWAY*

FROM remote antiquity Sudan gum has been an article of commerce. About the beginning of the Christian era it reached Europe through Arabian ports, hence the designation "Gum Arabic," applied to this gum. In the middle ages, Turkey being the ruling power in the Eastern Mediterranean, the name "Turkey Sorts" was applied to the article.

The best quality of gum arabic is collected from the grey-barked Acacia tree, *Acacia Verek* (or *Acacia Senegal*), which grows wild in desert regions of the Anglo-Egyptian Sudan and French Senegal, as well as in other parts of Africa and in Arabia. This tree is known in the Sudan under the name of "Hashab." Small quantities of Hashab gum, closely resembling the Kordofan product, are also collected in the Atbara, Gezireh and Gedaref provinces of the Sudan. Another species, *Acacia Seyal*, yields an inferior variety of gum called locally "Talha," which is known in this country under the name of "Ghezireh."

Collection of Gum Arabic.

The gum-collecting industry is principally carried on in the province of Kordofan, which lies to the west of the White Nile, some 200 miles south-west of Khartoum, and the most important markets for gum are held at El Obeid and Nahud, the former place being at present the railhead of the recently opened extension of the railway running through Khartoum to Port Sudan and Suakink, on the Red Sea. Before the railway was opened, Omdurman was the centre of the gum business, and the gum was sent down the Nile to Suez, Port Said and Alexandria, whence it was exported. Since the opening of the railway, Port Sudan has become the port of shipment, but owing to the scarcity of direct freight from Port Sudan, transhipment has now frequently to be effected at the Egyptian Ports, Suez, Port Said and Alexandria.

A large portion of the "Hashab" trees grow wild, but there are also gardens in which the trees are cultivated, and regularly tapped. The collection of gum, whether of the wild or garden variety, can only be effected during the dry season, say from November to June. As soon as the rains commence, any gum which has exuded is washed away and disappears into the soil. "Hashab" trees begin to yield gum when they are about three years old and eight to ten feet high; they are most productive between seven and fifteen years of age. Tapping requires a great care so as not to injure the trees, and a good deal of damage is done to the wild trees by collectors recklessly tapping them.

"Talha" gum is chiefly collected in the forests of the Blue Nile. There are two varieties of the *Acacia Seyal* tree; they are known as red and white Talha respectively, the bark of one being covered with a red powder and that of the other with a white powder. Both varieties produce gum, but the red gum variety is more plentiful than the white, and the gum is usually a mixture of the two.

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Grades of Gum Arabic.

The bulk of the Kordofan gum shipped to this country is termed "Natural," having bits of bark adhering to the lumps, just as it is brought in by the camels to the market at El Obeid, Nahud and other centres in the Kordofan province. The camel loads of gum are turned out into heaps for examination by the purchasers, after which the gum is packed into double gunny bags, for shipment to all parts of the world from Port Sudan. The old Nile route has been practically abandoned since the opening of the railway from El Obeid via Khartoum to Port Sudan.

For the American market the gum is almost invariably supplied "Cleaned," being picked over and the bark and straw removed. England and the Continent receives a certain proportion of Cleaned Kordofan Gum.

Another grade shipped is Cleaned and Sifted Kordofan gum, which is not only cleaned, but also passed through many sieves, so as to remove all the gum dust and any sand that may have found its way among the gum. This grade of gum, usually costing $1.20 or $1.40 per cwt. more than natural, is really the most economical for general purposes, as it can be used without any preliminary process of treatment.

Kordofan Gum Arabic usually contains between 12 and 15 per cent. of moisture, and Gum Senegal rather more. If the amount of moisture exceeds 20 per cent., the gum, instead of being brittle, is tough and difficult to grind to powder. On the other hand, gums containing less than about 12 per cent. of moisture are rather friable and apt to crack and break up into small fragments during transport.

Good samples dissolve almost completely in cold water, leaving undissolved only a small quantity of fibrous or sandy matter, which should not exceed 1 or 2 per cent. The rest of the gum forms apparently a perfectly homogeneous solution, though in reality the liquid usually contains a small amount of matter not completely dissolved, but in the form of a very thin jelly, the presence of which can be detected by filtering through a wad of cotton wool.

Gum arabic, although free from any trace of acid flavor, is nevertheless acid in the chemical sense, for its solutions turn blue litmus red. The acidity is very slight as an average, one thousand parts by weight of gum requiring on the average only about 2 parts of potash to produce exact neutrality. This faint acidity does not in any way lower the value of the gum for purposes of confectionery.

There appears to be a close relation between the color and the flavor of gum, deeply colored samples having in general a pronounced unpleasant taste. The reason for this is that the color is due to the presence of small quantities of tannins, which, of course, also confer their astringent flavor on the gum. Opinions differ as regards the origin of these tannins, some authorities holding that they are derived from the bark of the trees during exudation of the gum and others that they are formed in the gum itself by chemical changes. Gum senegal is usually more highly colored than the Kordofan gum, although a sharp

line cannot be drawn between the two classes in respect of this or any other character.

By exposing gum for some months to the baking rays of an African sun until it turns from an amber yellow to a more or less pure white, another grade termed "Bleached Kordofan" is produced. This quality is not ready for shipment till May or June, and its prime cost in the Sudan is something like 50 per cent. more than the "Natural." According to the degree of whiteness attained, it is classified into first, second and third grade Bleached, and it is mainly used for pharmaceutical purposes.

Gum arabic is an example of a natural product which chemical science has not yet enabled us to produce artificially, and the prospect of being able to do so in the near future appears very remote. As most users of gum arabic are aware, it is the substance which exudes from the stems of certain trees, of the genus *Acacia*. After being collected from the trees, it loses about 15 per cent. of its weight, representing moisture, and in consequence, becomes hard before shipment. Practically nothing is known as to the manner in which the gum is formed in the plant, but it seems probable that it is produced by chemical changes in the cellulose, which constitutes the basis of the cell-walls of vegetable tissues.

Gum arabic is composed mainly of the three elements, carbon, hydrogen and oxygen, and in this respect it resembles substances such as cellulose, starch, dextrine and the sugars; but unlike these (when they are pure), it contains about 3 per cent. of mineral matter, chiefly lime, potash and magnesia, which are usually found in plant tissues, and often a small amount of nitrogen. These minor constituents were for a long time looked upon as non-essential impurities, and it was usual to class gum arabic with cellulose, starch, dextrine and the sugars, as a carbohydrate, i.e., carbon chemically combined with water; in the light of present-day chemistry this is seen to be a superficial way of regarding them, but the word carbohydrate has remained in use nevertheless.

For a more correct understanding of the chemical nature of gum arabic, we are chiefly indebted to the work of a British chemist, O'Sullivan, who, about twenty-five years ago, succeeded in proving that gum is not a carbohydrate, but a salt, i.e. (compound of an acid with a base), or a mixture of salts. The mineral constituents of the gum form the basic component and the remainder represent the acid component. After releasing the acid from combination with the mineral matters, O'Sullivan isolated it in the free state, studied its composition and properties, and named it Arabinic Acid. It has an exceedingly complex structure and appears to consist of a rather simpler acid combined chemically with two of the less common sugars, viz., arabinose and galactose, the second of which, it may be remarked, is also a constituent of milk sugar. The chemical formula of the simpler acid just mentioned which O'Sullivan termed Arabic Acid, is C 23, H 38, O 22. That is to say, that the smallest particle of the acid which can possibly exist, and which the chemist terms the "molecules" is built up of 23 atoms of carbon, 38 atoms of hydrogen and 22 atoms of oxygen. The molecule of the original acid of gum arabic is much larger, for it contains not only the atomic grouping of the simpler acid, but also additional groups representing the sugars. O'Sullivan suggested the following formula for the original acid of gum arabic:

2 (C 10, H 16, O 8)	4 (C 12, H 20, O 10)	C 23, H 30, O 18
Arabinose groups.	Galactose groups.	Acid group.

It is not certain that the acid present in all samples of gum arabic is identical; indeed, many indications point to differences in the constituents of the acid, possibly in the nature and amounts of the sugars present.

The extreme complexity of the chemical structure of gum arabic is probably responsible for two properties of the substance which make it valuable in confectionery, viz., its thickening power, or in scientific language, the high viscosity of its solutions, and its inability to crystallize. Owing to the latter property, mucilages of gum, however thick, never assume a crystalline or granular texture, which would have the effect of reducing their binding power. The thickening power of different samples of gum arabic varies very considerably, some have a viscosity more than 50 per cent. greater than others. This is probably due to differences in the chemical constituents of the gum, though it is at present impossible to state what those differences are.

The characters of gum arabic which are of chief importance in confectionery are, absence of matters insoluble in water, absence of any pronounced color or flavor, and high viscosity or thickening power. Different samples are liable to vary in respect of all these characters. This is not surprising, seeing that gum is derived from several different species of trees and its quality is very probably influenced by such factors as the age of the trees, the accidental circumstances attending the exudation of the gum, and its treatment after collection. Systems of grading may, to a large extent, enable commercial products of fairly uniform character to be placed on the market, but absolute uniformity is not attainable.

There appears to be a close relation between the color and the flavor of gum, deeply colored samples having in general a pronounced unpleasant taste. The reason for this is that the color is due to the presence of small quantities of tannins, which, of course, also confer their astringent flavor on the gum. Opinions differ as regards the origin of these tannins, some authorities holding that they are derived from the bark of the trees during exudation of the gum, and others that they are formed in the gum itself by chemical changes. Gum senegal is usually more highly colored than Kordofan gum, although a sharp line cannot be drawn between the two classes in respect of this or any other characters.

It is not easy to judge exactly from the appearance of gum in bulk what degree of color it will show as a mucilage. The size and condition of the lumps may affect the judgment of the color very considerably. The smaller the lumps or tears, the more "frosted" their surface, the lighter will their color appear; and to carry the point further, a dark gum appears to lose all its color when ground to fine powder. The reason for this is simple. The full coloration of a transparent substance like gum will only be revealed by light which has passed through a considerable thickness of the substance. Light which falls on a powder has not an opportunity to penetrate the material to any extent; the innumerable particles present so many minute facets at all angles that practically the whole of the light is reflected and scattered before it has traversed more than the outermost layers of the powder. In the same way light falling on tears of gum, having a rough surface like that of frosted glass, is to a large extent reflected back from the surface without penetrating the gum at all; and if the tears are traversed by numerous cracks and fissures, the light that does penetrate into the interior is reflected back at one or other of the cracks

before it has proceeded far. For this reason fine differences of color between different samples of gum are best judged by comparison of solutions of the samples in water, the solutions being, of course, all of the same strength.

Polarization of Light.

Gum arabic, in common with many other vegetable products, such as starch and the sugars, has the power of rotating the plane of polarized light.

If polarized light is passed through pure water the plane of the vibrations, or the "plane of polarization" remains unchanged; for example, if the vibrations are vertically up and down when the light enters the water they will be of the same character when it emerges. But if the water contains in solution a substance like sugar, or gum arabic, the vibrations will undergo a certain amount of twisting or rotation, so that light entering the solution with vertical waves may emerge with the waves horizontal or at some other angle. Substances which act on polarized light in this way, rotating the plane of polarization, are said to be "optically active." The actual angle through which the plane of polarization is turned by any given solution depends on the distance through which the light travels in the solution, on the amount of optically active substance in a given volume of solution, and also on the nature of the optically active substance. Weight for weight, different substances have different degrees of rotary power, and whilst some rotate the plane of polarization in the same direction as the hands of a clock move, others rotate it in the opposite direction; the former, among which are cane sugar, starch, dextrine and glucose, are said to be dextrotatory, whilst the latter, which include most samples of gum arabic, are laevo-rotatory. The rotatory power of many substances also varies to some extent with the temperature.

The property of optical activity is made use of extensively in the analysis of materials containing sugars, dextrine and starch. To mention an example with which many confectioners will be familiar, the so-called "polarization" of raw cane sugar, is nothing but the optical rotatory power of the sugar expressed as a percentage of the rotatory power of the pure 100 per cent. cane sugar. If cane sugar were the only optically active substance in raw sugar, the "polarization" would indicate exactly the percentage of cane sugar present; as a matter of fact, it does not do so because there are small quantities of other sugars present which differ from cane sugar in rotatory power.

The optical rotatory power of gum arabic is by no means the same for all samples, but before this extent of variations can be indicated the method of expressing this property numerically must be explained. The scientific measures of the optical activity of a substance is the "specific rotatory power. This is the angular rotation produced by a layer, 10 centimetres thick, of a solution containing 1 gramme of the substance per cubic centimetre. It is not practicable to work with a solution of this strength, but the rotation of a comparatively dilute solution, e.g., 10 per cent., is first found, and that of the standard concentration is computed by simple calculation. Since the rotation depends on the wave-length of the polarized light used, and to some extent also on the temperature, it is usual to indicate these particulars in statements of specific rotary power, at 20° C. (68° F.), for light of wave-length corresponding with that of the D Sodium line in the spectrum, i.e., the yellow light produced by introducing salt into a non-luminous flame. For pure cane sugar + 66.6 (the plus sign indicates rotation to the right or dextrotation), whilst pure dextrine and soluble starch give values in the neighborhood of 200. Very contradictory statements have been published respecting the specific rotatory power of gum arabic, but the majority of authorities are agreed that, unlike the substances just mentioned, it is usually laevo-rotatory. For most samples of good quality, whether from the Sudan or Senegal, the rotation lies between 23 and 34, but values outside these limits are not infrequent, and occasionally samples are met with which are strongly dextro-rotatory.

Very interesting is the explanation which chemistry gives for the appearance of optical activity in some organic compounds and not in others. This explanation was first suggested in 1874 by two continental chemists, Le Bel and Van't Hoff, and it affords most striking confirmation of the chemical theories concerning the manner in which the molecules of organic compounds, (i.e. compounds containing carbon as one of the elements of which they are composed). The molecule of a compound it represented as consisting of a number of different atoms linked together on a certain definite plan which is characteristic of the particular compound and determines its chemical properties. For the majority of the many thousands of organic compounds which exist, the arrangement of the atoms in the molecule is known with practical certainty. Each carbon atom has the power of linking up with four other atoms of one element or the power of linking up with another, which of course may in turn be linked up with other atoms, and thus form part of an atomic group within the molecule. Now optical activity is shown only by compounds containing in the molecule a carbon atom linked with four atoms or atomic groups all of which differ from one another. If any two of the four are alike optical activity is impossible.

Theoretical deductions exactly fit the known facts concerning optical activity in organic compounds. Only those compounds which contain an "asymmetric" carbon atom in the molecule, i.e., a carbon atom linked with four different atoms or groups, are capable of optical activity. Such compounds can exist in two forms identical in chemical properties, but differing in that whilst one is dextro-rotatory, the other is laevo-rotatory in an exactly equal degree. A mixture of equal quantities of the two forms is thus optically inactive, and such a mixture is invariably obtained in the first place when a compound containing an asymmetric carbon atom is synthesized from optically inactive materials, by ordinary chemical processes in the laboratory. By suitable means, however, the two active forms may be separated. When the compounds containing an asymmetric carbon atom are produced in plants or animals, i.e., under vital conditions, one of the two forms is usually produced in preference to the other. As regards certain natural products which have not yet been synthesized artificially, such as cane (or beet) sugar and gum arabic, only one active form is at present known, but there is no doubt that the opposite form is capable of existence. These compounds contain several asymmetric carbon atoms in the molecule, and their synthesis in the laboratory presents great practical difficulties which have not yet been overcome.

Viscosity.

It is well known that samples of gum arabic differ in thickening power; that is, if made into mucilages of the same concentration, some will exhibit greater thickness or viscosity than others. The importance of this character is obvious, and in any scheme of scientific valuation of gum arabic the measurement of viscosity must occupy a

prominent place. Unfortunately, there is at present no general agreement as to the best method to be adopted for measuring the viscosity of gums. A variety of apparatus and methods have been used, and the results obtained with one cannot, as a rule, be compared with those obtained with another, because so much depends on the particular apparatus used and the conditions under which the test is carried out. As a matter of fact those who make viscosity tests on gum are usually not concerned with obtaining results which can be compared with those found by other operators, their aim being, in most cases, simply to make a more or less rough comparison of the viscosity of a number of samples to ascertain which are the best. For this purpose the kind of apparatus employed is of minor importance (though, of course, some allow of much greater importance than others), the essential points being that the same apparatus must be used throughout, and the tests must all be carried out in exactly the same manner. The samples must, of course, be compared in solutions of the same concentration, e.g., 10 per cent. or 20 per cent., and the solutions freed from insoluble matters by filtration. Certain points in the preparation of the solutions will be referred to later.

Very rough comparative tests of the viscosity of the solutions may be carried out by comparing their rates of flow through a given tube of narrow bore; for instance, a glass pipette may be used. This is filled with each of the solutions in turn, and held vertically while the liquid is allowed to flow out again. In each case the time required for the level of the liquid to fall from a mark above the bulb to another mark below it is noted. These times may be taken as a rough indication of the relative viscosities of the solutions. The bore of the tube of the pipette should be small enough to ensure that the solution only flows out very slowly, occupying about 60 to 120 seconds from mark to mark.

Another simple form of apparatus, capable of much greater precision than the last is the so-called Ostwald viscosimeter. This has been used for the testing of gum arabic samples at the Imperial Institute, London, and at the Wellcome Research Laboratories, Gordon Memorial College, Khartoum. It consists of a U-shaped glass tube of narrow bore, having a bulb in each limb, one being at a higher level than the other. A definite volume of gum solution is introduced into the tube so as to fill the lower bulb. It is then drawn up into the higher bulb, and the time taken for it to flow back out of the latter is measured. An important advantage of this instrument over the pipette is that it may stand in water before the test to adjust the temperature of the solution in it.

There are several types of standard viscosimeters designed for measuring the viscosity of lubricating oils. They are relatively elaborate and expensive, being made exactly to pattern, so that the identical results may be obtained with all those of the same type. In Redwood's viscosimeter, which is the standard instrument for oil-testing in England, a certain volume of the oil is allowed to flow through a small orifice in the bottom of a metal receptacle surrounded with an outer casing containing water or other liquid to control the temperature. The time taken by the outflowing of the given volume of oil is taken as a measure of the viscosity. Engler's Viscosimeter, largely used on the Continent, is somewhat similar in construction, but the oil flows out through a narrow tube of definite length and bore. This instrument has been used by certain Continental chemists in examining gum arabic solutions.

The so-called torsion viscosimeter, used for oil-testing in America, is based on a different principle altogether, but it deserves mention, as it has been used for investigations of gum arabic samples at the Gordon College, Khartoum. In this apparatus a metal cylinder is suspended, in the liquid to be tested, by a wire. By twisting the top of the wire through 360°, the cylinder is set in motion; it revolves first in one direction and then in the other, but less and less each time, the falling-off depending on the viscosity of the liquid. Means are provided for measuring the angle through which the cylinder revolves each time, and the extent to which the second revolution falls short of the first may conveniently be taken as a measure of the viscosity of the liquid for comparative purposes.

From the account already given of the different forms of apparatus used for viscosity tests with gum arabic, it appears that what is actually measured in most cases is the time taken for a certain volume of gum solution to flow through a certain tube or orifice. This time is assumed to be proportional to the viscosity of the solution. It is approximately so for the same tube or orifice, provided the other conditions remain the same. It is therefore permissible to compare the gum solutions with the same apparatus, but the time of flow of any given solution will generally not be the same in different apparatus. In order to be able to state the results of viscosity tests in a form independent of the particular apparatus used, it has been suggested that they should be expressed in terms of cane sugar solutions; for instance it might be stated that a given gum sample, in 10 per cent. solution, has a viscosity equal to that of a solution of pure cane sugar containing, say, 60 grams of sugar per 100 cubic centimetres. This would involve, once for all, with each apparatus, an investigation of the times of flow of cane sugar solutions of different concentrations, to serve as a basis for comparison with gum solutions. As a rule the viscosity of 10 per cent. gum solutions corresponds with that of sugar solutions containing 60 to 70 grams per 100 cubic centimetres. Gum solutions of 20 or 30 per cent. cannot well be compared in this way with sugar solutions, as their viscosity is too high.

Apart from the particular form of apparatus used, there are various conditions which must be observed to obtain strictly comparable results with different samples. The viscosity of a gum solution depends, of course, on its concentration, so that uniformity in this respect is essential. Some chemists use 10 per cent. mucilages for the tests; others prefer higher concentrations, e.g., 20 per cent. Where it is only required to compare a number of samples it would appear a matter of indifference which concentration is adopted, so long as the same is used in all tests. This is not the case, however, for the same relative results are not always obtained at the different concentrations. Inasmuch as the higher concentration approaches more nearly than the lower to the conditions under which the gum is actually used, the results obtained at 20 per cent. appear to be entitled to greater weight than those obtained at 10 per cent.

Another point of practical importance is that comparative tests must be always carried out at the same temperature; in accurate tests a difference of 1 degree will appreciably affect the results. It is very necessary also to adhere strictly to a uniform method of procedure in

preparing the gum solutions, for apparently trivial differences in working may affect the results. It is not a matter of indifference whether the gum is in the first place dissolved in hot or in cold water; lower results are often found in the former than in the latter case, though the actual viscosity measurements are made at the same temperature in both cases. Again, in dissolving gum, if the whole of the water necessary to obtain a solution of the required concentration is added at the outset, somewhat higher viscosity results may be obtained than if only a part of the water is added at first, the solution being afterwards diluted to the required extent. After an apparently homogeneous solution has been obtained it is advisable to allow it to stand for some hours before testing. Dr. Beam, at the Gordon College, Khartoum, records an interesting observation on this point. A solution was made by adding water to the powdered gum and leaving it to stand over night. It was then agitated until apparently homogeneous, and filtered first through cotton wool and then through filter paper with the aid of a filter pump. The viscosity of the filtered solution continued to diminish for about an hour after filtration, being about 10 per cent. lower finally than at first.

The method adopted by Dr. Beam for the preparation of 20 per cent. gum solutions for viscosity tests was to weigh out a quantity of the powdered gum containing 40 grams of actual gum (i.e., apart from moisture) and add 160 grams of distilled water. The mixture was stirred with a glass rod until no more particles could be seen, after which it was covered from the air, and left to stand for 5 or 6 hours.

Gum Tapping.

It has previously been mentioned that most of the Sudan gum is derived from the grey-bark *acacia tree*, *Acacia verek* (S. Senegal), known as the Hashab in the Sudan. The trees are rather small, usually from ten to twenty feet high, and grow on a poor, sandy soil, which is reddish from the presence of iron. The greater part of the gum of good quality is collected from trees in enclosed, privately owned tracts of land known as geneinas. In these the trees are "tapped" by natives some time between October and February, i.e., after the close of the rainy season. Tapping consists in rémoving the strips of the outer bark, about 2 to 3 feet long and 1 to 3 inches broad. Liquid gum slowly exudes from the exposed parts and gathers into tears, which gradually dry and harden on exposure to the atmosphere. The rate of exudation depends on the temperature, being more rapid in warm than in cold weather. The first collection of gum is made several weeks after tapping. Further quantities subsequently exude, and it is usual to make six or eight collections from the same tapping, at intervals of a few weeks, throughout the dry season, which lasts until May or June.

The quantity obtained at successive collections usually diminishes as the season advances, but this is not invariably the case, the later collections being sometimes remarkably productive. The total yield of gum from a tree for the whole season is usually about one or two pounds, but often less and sometimes much more. The larger trees yield better, on the average, than the smaller ones, but there are other factors some of which are at present unknown. Cold weather at the time of tapping and for some days afterwards, may seriously reduce the yield of gum throughout the season. It is not considered advisable to tap the same tree two years in succession.

Some experiments were made at the Gordon Memorial College, Khartoum, by Dr. Beam and E. S. Edie, to compare the qualities of the gum obtained at successive collections from the same tappings. They found that the gum of the earlier collections was in many cases more friable than that of the later ones. When the samples were tested within a few weeks after collection it was often observed that the earlier ones were not perfectly soluble in water (20 per cent. solutions), a kind of glairy slime separating slowly from the dissolved portion, and also that they showed a higher viscosity strength than the gum of later collections. In the course of storage for several months, however, this early gum became normal, yielding homogeneous solutions and showing the same viscosity strength as the later samples. The high viscosity of the early samples is attributed to the presence of the imperfectly soluble constituent which slowly undergoes transformation into normal gum during storage. The presence of this constituent is much more easily recognized in 20 per cent. solutions than in weaker ones; it seems to dissolve practically completely in 10 per cent. solutions.

According to Dr. Beam, Sudan gum from Hashab trees consists of a mixture of two varieties, one of which is softer than the other. When exposed to the sun, the former becomes "bleached," whilst the harder variety retains its glassy, transparent appearance. The "bleaching" of the softer variety is more apparent than real, and is mainly due to the fact that, on drying, the pieces become traversed by numerous cracks which mask their real color to some extent, as explained in this article. The harder produce is, of course, the more valuable commercially, but the conditions which favor its formation are not yet known, so that there is at present no means of encouraging its production at the expense of the softer kind.

As already mentioned, the gum tapped Hashab trees constitute the bulk of the Sudan gum of good quality. A relatively small amount is collected from trees of the same species outside the "geneinas." On these trees, which are not systematically tapped, the gum exudes at cracks and fissures in the bark. It is known locally as wady gum, and is darker and generally of lower quality than geneina hashab from tapped trees.

Bacterial Theory of Gum Formation.

The causes responsible for the formation of gum arabic are not yet understood. The plant tissues consist of innumerable cells, the walls of which, composed of a complex substance known as cellulose, make up the greater part of the material of the plant. The gum is formed by a chemical transformation of the cell walls, and probably also of starch granules contained in some of the cells. In the tissues undergoing "gummosis" the cell walls swell and become less distinct, and finally all trace of cellular structure is lost, the tissue being transformed into a fairly homogeneous gummy mass. In some plants cavities filled with gum are in this way formed in the interior of the stem, and remain enclosed; in others the gum exudes. In the case of the tree from which gum arabic is obtained, "gummosis" commences, according to Lutz, in the cambium layer of cells, i.e., in the growing layer, and spreads towards the centre of the stem along the medullary rays, and also outwards towards the bark, eventually exuding through fissures in the latter and hardening in tears on the outside. It is uncertain whether the formation of gum should be regarded as a malady of the plant or as a defensive measure designed to seal up wounds in the bark

and thus protect the plant against invasion by alien enemies such as insects, moulds or bacteria.

A very interesting theory is that the gum is produced in the plant by bacteria which gain access where the bark has been tapped or otherwise broken. About fifteen years ago this theory was strongly advocated by Dr. Greigh Smith, as the result of an extensive research on a number of trees growing in Australia, including one species of acacia. He succeeded in isolating from these trees a number of bacteria which, when grown in certain nutrient media, produced substances resembling the gums in certain respects, and concluded that these bacteria were responsible for the formation of gum in the various plants. He pointed out that if the bacterial theory is correct, there is a prospect of greatly increasing yield of gum, by inoculating the trees with the bacteria responsible for its formation, instead of relying on chance infection.

This point was later investigated by E. S. Edie at the Gordon Memorial College, Khartoum. He found that gum-bearing twigs of *Acacia Verek* (producing the Kordofan of "Hashab" gum) invariably contained a certain gum-like substance when grown in certain nutrient solutions. This he assumed to be the organism responsible for the production of gum in the trees, and he suggested that the tapped surfaces of the trees are under ordinary circumstances inoculated with it by the agency of flies and ants which were observed to frequent them. A number of such flies and ants were investigated, and in all cases some of the bacteria were found on them. Attempts were made to inoculate some of the Hashab trees by rubbing their freshly tapped surfaces with a moist rag, previously infected with the bacteria. The results were the reverse of what was anticipated, for the yield of gum from tappings treated in this was considerably less than usual. This negative result does not, of course, disprove the bacterial theory, and, indeed, Edie has suggested an explanation of it, viz., that the wiping with rag removed some exuded gum, and therefore fewer ants and flies were attracted to the tappings, and inoculation was, in consequence, less effective than usual. In this connection some further experiments were made by the same investigator, which are of interest. Freshly tapped surfaces of the trees were moistened with solutions of various antiseptic substances, including formalin, mercuric chloride, and hydrochloric acid. Mercuric chloride acted as was expected, by greatly reducing the yield of gum, whilst the other two, on the contrary, increased the yield. Whatever may be the correct explanation of these results, the bacterial theory of the origin of gum cannot yet be held to be demonstrated, and the large increases in the production of gum anticipated by Greigh Smith as the result of artificial inoculation of the trees has not yet materialized.

Contracts.

Contracts for gum arabic are not made upon samples, but upon description, "fair average quality at the time of shipment." Gum being a natural product, there are variations in quality from season to season, and also between the quality collected in the early, middle and end portions of the same season, due to weather conditions.

DEVELOPING SASKATCHEWAN DEPOSIT OF GLAUBER'S SALT.

The Southern Alberta Refineries, Ltd., is the name of the company developing the deposit of sodium sulphate at Fusilier, Sask. Mr. William Livingston is the president.

Industrial Distribution of Sulphuric Acid.

Mr. A. E. Wells, of the Bureau of Mines, Washington, has prepared a survey of the production of sulphuric acid in the United States. This most important chemical was produced in Canada at a relatively early date, and a concise knowledge of its use in various fields is something that is of general interest to chemists and manufacturers. What is applicable to the United States holds for Canada, and in the fertilizer, metallurgical, and possibly, at an early date, in the oil refining fields, its use is most likely to be considerably extended.

Referring to his report for the United States, Mr. Wells states that sulphuric acid is one of the most important of all chemicals, not only because of the large quantities manufactured, but also because of the wide use of the acid in many different industrial works. Sulphuric acid is to the chemical industry what iron is to metallurgy. The general public, however, does not realize this fact, for sulphuric acid does not appear in the finished product as does iron and steel, but is only a means to an end. It is essential in many industries, such, for example, as in the manufacture of phosphate fertilizers, explosives, dyes and petroleum products. In recent years in the United States, especially in the East, the demand for sulphuric acid for chemical and metallurgical industries has been an accurate and sensitive barometer of the general business conditions. This demand for acid responds much more quickly to a general slump or boom in the industrial world than does the demand for iron and steel.

The more important uses are as follows:

1. **Dilute acid**—that is, 60° B. (78 per cent. H_2SO_4) acid, or weaker, is used in the manufacture of superphosphates, ammonium sulphate, and sulphates of metals (magnesium, aluminum, iron, zinc, copper); in precipitating barium and calcium sulphate for chemical purposes; in the manufacture of various mineral and organic acids; in pickling sheet iron for tinning and galvanizing; in the production of copper, zinc, silver, nickel and gold; for various types of galvanic batteries, storage batteries, electroplating; in the manufacture of ether; in making and purifying many organic coloring matters; in making starch, syrup and sugar, and in numerous other chemical and metallurigcal operations.

2. **Concentrated acid**—that is, acid 60°B. (78 per cent. H_2SO_4) to 100 per cent. H_2SO_4—is used for purifying benzene, petroleum, paraffin oil, or other mineral oils; for manufacture of nitroglycerin, pyroxylin, nitrobenzene, picric acid and various other nitric compounds and nitro ethers; and in the manufacture of fatty acids by distillation.

3. **Fuming acid (oleum)** is used principally for the manufacture of various forms of explosives, certain organo sulphuric acids, and in fortifying weaker acids.

The greatest consumption of sulphuric acid is in manufacture of phosphate fertilizer, refining of petroleum products, pickling of iron and steel, manufacture of nitrocellulose, nitroglycerin, celluloid, etc., and in general chemical and metallurgical operations.

During the summer of 1918, a census of the distribution of sulphuric acid to the different industries showed that the monthly requirements were about 390,500 tons of (100 per cent. H_2SO_4) acid. Of this amount the manufacture of military and domestic explosives consumed 36.0 per cent.; fertilizers, 28.4 per cent.; oil refineries, 8.8 per cent.; chemicals, drugs and ammonium sulphate, 9.9 per cent.; steel pickling and galvanizing, 9.3 per cent.; fabrics, tex-

tiles, etc., 1.3 per cent.; paints, lithopone, glue, etc., 1.4 per cent.; metallurgical, including storage batteries, 3.9 per cent.; and miscellaneous uses, 1.0 per cent.

Eliminating the acid used for munitions and explosives, and allowing about 10,000 tons a month for domestic explosives, the indicated requirement for normal peace industries is possibly 260,000 tons a month (basis, 100 per cent. H_2SO_4), or about 5,000,000 tons per year (basis, 50°B.). Prior to the war the consumption of acid for phosphate fertilizer was about 2,300,000 tons (basis, 50°B.). Up to June, 1919, the consumption of acid for phosphate fertilizers was more than 2,500,000 tons, and the consumption will doubtless increase year by year. Not only is the use of phosphate fertilizer increasing in the South, but is beginning to be an important factor west of the Missippippi River. The gradual increase in consumption of phosphate fertilizers in the middle west and western states will bring into existence acid and phosphate-fertilizer plants in connection with the smelters in Montana and Utah, where much waste gas is available. Approximately 1 ton of acid (50° B. basis) is required to treat 1 ton of phosphate rock to produce the ordinary superphosphate.

The acid used for refining petroleum is practically all 66° B. acid. Weaker acid is not satisfactory, as it will not enter into the reactions involved in decolorizing and deodorizing of the oils by removal of the unsaturated hydrocarbons. In a few instances, where weaker acid might possibly be used, so much more of it would be required to obtain the results obtainable with the 66° acid that its use is not economical. In petroleum refining, fuming sulphuric acid is used exceptionally; its principal and practically only use is by certain eastern oil refineries in the preparation of colorless and odorless oil, known as "nujol." When fuming acid is used, sulphonates are obtained, known as "Twitchell's reagent."

The amount of acid used per gallon of refined product varies primarily with the character of the crude oil and also with the refining methods employed. For the manufacture of gasoline, the general consumption varies between 0.04 and 0.15 pound of acid (66° B.) per gallon; for refined oils, 0.06 to 0.20; for lubricating oils, 0.08 to 0.80.

In the manufacture of explosives, sulphuric acid is used for two purposes: (1) for the production of nitric acid or mixed acids used in nitrating the organic bodies—that is, cellulose, toluol, phenol, etc., and (2) as a dehydrating agent. For nitrating purposes 66° B. acid is used, but stronger acids are required for dehydrating purposes. In domestic commercial explosives about 1.6 pounds of acid are consumed per pound of nitroglycerin contained therein. The estimated consumption for this use is about 7,500 tons per month (basis, 100 per cent. H_2SO_4). In the manufacture of military explosives the net consumption of acid varies greatly, according to the efficiency of the plant and the amount of acid recovered. Data obtained in 1918 indicates an average consumption as follows: For smokeless power, 2.3 pounds (100 per cent. H_2SO_4) of acid per pound of product; for TNT, 2.2; for picric acid, 6.5.

With the gradual elimination of the bee-hive coke oven by the by-product coke plant, more ammonia will be available for the production of ammonium sulphate fertilizer, and this will require more and more acid, possibly as much as 15,000 tons (100 per cent. H_2SO_4) a month.

For the pickling of steel for tinning and galvanizing, the consumption is approximately 30,000 to 35,000 tons per month (100 per cent. H_2SO_4), when the production of plate and galvanized ware is heavy. This acid is usually shipped to the pickling plant as 60° acid.

The consumption of acid for metallurgical purposes, in connection with the treatment of zinc and copper ores, has increased greatly in the West during the past few years. Part of the acid is used in the flotation of copper, lead and zinc minerals from their ores. Also a large amount is used in leaching ores and waste tailings for recovery of the copper or zinc content.

Skilled Workmen Vote for Scientific Control.

One of the largest Canadian pulp and paper mills, the Abitibi Power and Paper Company, Iroquois Falls, Ontario, has, by unanimous consent by vote of its skilled workmen, superintendents and foremen, decided to have scientific control of all operations. "The Broke Hustler," the plant newspaper, refers to this important forward step as "an epoch in the pulp and paper industry," and continues to say: "For about two years now partial scientific control has been a fact. At first it was not thought much of by the operators, but as they came to see what it really meant, that it was not opposed to the practical side but was an aid to it, they changed their attitude, and by an unanimous vote declared themselves heartily in favor of scientific control. It means a great deal to the mill to have its operators, the men on whom the success of the idea depends, so wholeheartedly behind it. . . . It means they are studying the operations they perform, and not merely doing them mechanically."

In addition to voting for scientific control, the men also voted solidly in favor of technical classes which would enable them to increase their knowledge of the whole process of pulp and paper making. Ballots were taken as to what courses the men wanted, and 50 out of 68 signified their intention of taking the whole course, while the remainder decided on partial courses. Mr. R. A. McInnis, manager, in addressing the operators, said that greater efficiency in operation was necessary, so that greater production would result at less cost. No outlet in cost reduction was to be looked for in decreased wages, as wages would never decline to their former level. Scientific control was the best solution of the difficulty, and this, the manager stated, required co-operation among engineers, chemists and operators.

"If we are going to operate for a lower cost and greater production we must make a greater study of operation. For instance, we can see that twelve tons of ground per stone is possible, but we do not yet see how it can be done and produce good pulp. We can see six-hour cooks, but we do not yet see how. In other words, we can see the house, but we do not yet see the road to the house. So we must study operation more deeply, and it is for this reason that we are having the courses of study in regard to the various departments of the mill," said Mr. McInnis.

The courses decided on are eight in number, as follows: Wood Technology, giving a brief outline of the chemical and physical properties of interest to pulp and paper makers, and the choosing of kinds of wood for pulp-making; Sulphite Pulp Manufacture; Paper Manufacture; Acid Making, including the chemistry needed for a thorough understanding of the subject; Steam Plant Operation; Refining of Pulp; Mechanical Maintenances and Installation.

Following the initiating of the scheme of scientific control, Mr. McInnis further addressed the men at the plant dinner, emphasizing the great forward step they had taken by deciding for such control and by their desire for more knowledge of the operations.

The Manufacture of Fine Chemicals in England

A British Source of Fine Chemicals for Research Work for Universities and Industries

IN the manufacture of fine chemicals, England is in something like the same position as in the production of dyes. Manufacturers are prepared to undertake the production of these various necessary chemicals, provided they are assisted by those who use them. It amounts to simply this, that if a preference is shown to German manufacturers or others, the industry will not be built up. English manufacturers are prepared to go a long way to meet all competition, and all chemists should keep themselves informed at least as to what may now be obtained. Prices are not discussed here, but the products available are listed. The Association of British Chemical Manufacturers, with offices at 166 Piccadilly, W. 1, London, England, has issued a recent list of all special C.P. fine chemicals now manufactured in England, and those they are prepared to make, if any reasonable demand is forthcoming. The total sales of these chemicals may not be a large factor in trade, but the importance of a British source is not secondary. Every chemist and university will be interested in some of the following list. These are now being supplied research chemists:

Abrastol; acenaphthene; acetal; acetaldehyde, B.P., 21°; acetamide; acetanilide; acetic acid, 100%; acetic anhydride, free from homologous anhydrides; acetine (mono); acetone, refined B.P., 56°-57°; acetone sulphite, acetophenone; 1. acetylamino anthraquinone; acetyl-chloride; acetylene dichloride; acetylene tetrachloride, acety-phenetidine (see phenacetine); acetyl-salicylic acid; acetyl-succinic ester; aconitine; aconitine hydrobromide; allantoin; allyl alcohol; allyl iodide; allyl isothiocyanate; aloin; amino-azobenzene hydrochloride; amino-benzoic acid (ortho); amido G. acid (coml); amido-phenol (para); amido-phenol hydrochloride (para); amidopyrin; 1. amino anthraquinone; amino sulphosalicylic acid; amyl acetate for photometry (Hefner lamps); amyl alcohol (iso), pyridine-free; amyl benzoate (iso); amyl butyrate (iso); amyl formate (iso); amyl iodide; amyl nitrate (iso); amyl nitrite (iso); amyl salicylate (iso); amyl valerate (iso); anethol; anhdyroformaldehyde aniline; aniline (refined); aniline hydrochloride; aniline oralate; aniline sulphate; anisaldehyde; anisidine (ortho); anisole; anthracene (refined); anthranilic acid, see amido-benzodic acid (ortho); anthraquinone (coml); anthraquinone (pure); 1: 5 anthraquinone disulphonic acid; 1: 8 anthraquinone disulphonic acid; 1: anthraquinone sulphonic acid; 2: anthraquinone sulphonic acid; antimony pentachloride; antipyrine (1-phenyl-2: 3-di-methylpyrazolon); apomorphine hydrochloride; atropine cryst.; azoxybenzene.

Benzal chloride (tech.); benzaldehyde; benzamide; benzamine hydrochloride; benzanilide; benzanthrone; benzene "for analysis" and for determination of molecular weights; benzene sulphonic chloride; benzidine, refined; benzidine hydrochloride; benzil; benzoic acid; benzoin; benzonaphthol; benzophenone; benzophenone oxime; 1-benzoylamine anthraquinone; benzoyl chloride; benzyl acetate; benzyl lacohol from toluene; benzyl aniline, benzyl benzoate; benzyl butyrate; benzyl chloride; benzyl cinnamate; benzyl cyanide; benzyl ether; benzyl formate; benzyl valerate; berberine and salts; borneol; bornly acetate; bornyl valerate; brom-benzene; ω-brom-camphor; α-brom-naphthalene; brom-phenol (para); bromoform; brucine; butyl acetate (iso); *n*-butyl acetate; butyl alcohol (iso); butyl alcohol (normal); butyl benzoate; butyl butyrate; butyl formate; butyl iodide; butyl nitrite; butyl salicylate; butyl valerate; *n*-Butyric acid.

Cacodylic acid; caffeine; camphor; camphoric acid; camphoric anhydride; cantharidin, B.P.; carbamide (see urea); carbazole; carbon disulphide; carbon tetrachloride; carophyllene; carvacrol; carvol (carvon); cerotic acid; ceryl alcohol; chloracetic acid; 1-chloranthraquinone; 2-chloranthraquinone; chloral alcoholate; chloral hydrate; chlorbenzanthrone; chlorzenzene; chlorbutol (trichlor tertiary butyl alcohol); chlor. dinitrobenzene (refined); chlorine (liquid); chlornitrobenzol (para); chloroform; chlorophyll; chlorphenol (ortho); chlor-phenol (para); cinchonidine; cinchonidine; cinchonine cryst.; Cineole; cinnamic acid; cinnamic aldehyde, citral, citric acid; citronellal, refined; citronellol; cocaine; codeine and salts; cotarnine hydrochloride; coumarin; cresol (ortho); cresol (meta); cresol (para); cresotinic acid (ortho); cresyl acetate (ortho); cresyl acetate (meta); cresyl acetate (para); cresyl methyl ether (ortho); cresyl methyl ether (meta); cresyl methyl ether (para); cyanacetamide.

Dextrin; dextrose; diacetyl dioxime (dimethyl gyloxime); diamino anthraquinone; dianisidine, refined; diastase; diazo-amido benzene; dibenzyl; dibrom-benzene (para); dichloracetic acid; 1:8 dichloranthraquinone; 1:5 dichloranthraquinone; dichlor benzene (ortho); dichlorbenzene (para); 1:5 dibenzoyldiamino anthraquinone; diethylaniline; diethyl acetic acid; diethyl-barbituric acid; diethyl ethyl malonate; dimethyl aniline; dimethyl-amino-azobenzene; dimethyl-amino-benzaldehyde (para); dimethyl sulphate (see methyl sulphate); 1.5 dinitroanthraquinone; dinitro benzene (meta), refined; dinotro benzene (meta), coml.; dinitro cresol (ortho); dinitronaphthalene (coml.); dinitrostilbene disulphonic acid; dinitrotoluol; dinitro phenol ($OH:NO_2:NO_2 = 1:2:4$); 1:5 dioxyanthraquinone; 1:4 dioxyanthraquinone; diphenylamine cryst.; diphenyl-methane; diphenyl-thiourea (sym.).

Emetine; emetine hydrobromide; emetine hydrochloride; emodin; eosin; erythrosin; eserine; ethyl acetate; ethyl aceto-acetate; ethyl alcohol, 99.8% (74.5 o.p.); ethyl aniline (mono); ethyl benzoate; ethyl bromide; ethyl butyrate; ethyl carbamate; ethyl carbonate; ethyl chlor-acetate; ethyl chlor-carbonate; ethyl chloride in sealed tubes; ethyl cinnamate; ethyl cyan-acetate; ethylene bromide; ethylene-diaminehydrate; ethyl ether for anaethesia; ethyl ethyl malonate; ethyl formate; ethyl iodide; ethyl malonate; ethyl nitrite (alcoholic solution 15%); ethyl oenanthate; ethyl oxalate; ethyl salicylate; ethyl tartrate; ethyl valerate; eucalyptol; eugenol.

Fluorescin; formaldehyde solution; formamide; formanilide; formic acid; formyltoluylene diamine; freund's acid; fuchsin; fumaric acid; furfurol.

Gallic acid; gamma acid; gelsemine hydrochloride; geraniol; geranyl acetate; geranyl butyrate; geranyl for-

mate; geranyl valerianate; glycerol; glycero-phosphoric acid solution 25%; glyceryl triacetate; glycocoll (see amino-acetic acid); glycocoll ester hydrochloride; grape sugar (see dextrose); guaiacol cryst.

H. acid; haemoglobin; hexachlorethane; hexa methylene tetramine; hippuric acid; homatropine; homatropine hydrobromide; hydrastine; hydrastine hydrochloride; hydrastinine hydrochloride; hydrazine hydrate; hydrazine hydrochloride; hydrazine hydrochloride; hydrazine sulphate; hydrazobenzene; hydrazotoluene; hydrobromic acid, 1.49 free from chlorine; hydrobromic acid in acetic acid; hydrochloric acid (pure synthetic); hydrogen (compressed); hydriodic acid, 1.7 (Zeisel); hydroquinone; hydroxylamine hydrochloride; *p*-hydroxyphenylethylamine; hyoscine hydrobromide; hyoscyamine; hyoscyamine sulphate.

β-Iminazolylethylamine; indigo carmine powder (commercial); iodine resubl.; iodobenzene; iodoform, cryst.; ionone (α and β); isatin; iso-eugenol; iso-eugenol acetate; isopilocarpine; isosafrol.

K. acid.

Lactic acid 1.21; lactose; landanosine; levulose; ligroin 0.72 — 0.72; linalool; linalyl acetate; linalyl butyrate; lyinayl valerate.

Magenta base; malic acid; malonic acid; maltose; mannitol; meconic acid; menthol; menthyl acetate; menthyl valerate; mesityl oxide; methoxy cinnamic aldehyde; methyl acetate; methyl alcohol; methyl-amine 33% solution; methyl benzoate; methyl carvacrol; methyl ethyl ketone; methyl eugenol; methyl formate; methyl iodide; methyl iso eugenol; methyl oxalate; methyl salicylate; methyl sulphate; milk sugar (see lactose); myristic acid.

Naphthalene; 1:5 naphthalene disulphonic acid; naphthionic acid; α-naphthol; β-naphthol; β-naphthol disulphonic acid, R-salt coml. (2:3:6), G-salt coml. (2:6:8); β-naphthol ethyl ether; β-naphthol methyl ether; α-naphthol sulphonic acid (1:4) coml. (Neville Winther acid); 2-naphthol-6-sulphonic acid; α-naphthylamine; β-naphthylamine (refined); nitraniline (ortho); nitraniline (meta); nitraniline (para); 1:4 nitro acetylamino anthraquinone; 1:4 nitro amino anthraquinone; 1. nitroanthraquinone; nitro dichlorbenzene; nitro guanidine; nitronaphthalene; *p*-nitro-ortho-toluidine; nitropara-cresol; *m*-nitroparatoluidine; nitro-phenol (ortho); nitro-phenol (para); nitrose-antipyrine; nitroso-β-naphthol; nitrose dimethylaniline; nitrose phenol; nitrosulphosalicylic acid; nitrotoluene (ortho); nitro-toluene (para); *p*-nitro-toluene, sulphonic acid; nitro-urea.

Œnanthol; oenanthic acid; oleic acid; oxalic acid; oxamethane; oxamide; oxanilide; oxyquinoline sulphate (ortho); paraldehyde; pentachlorethane; pentane (normal) from petroleum; perchlorethylene; petroleum ether, 0·64-0:66; phellandrene; *m*-phenylene diamine (refined); phenacetine; phenetidine (para) refined; phenetol; phenolphthalein; phenol (synthetic); phenyl acetaldehyde; phenyl acetate; phenyl acetic acid; phenyl bromothylene; phenyl carbonate; phenyl ethyl acetate; phenyl ethyl alcohol; phenyl glycine potassium salt; phenyl hydrazine; phenyl hydrazine hydrochloride; phenyl hydrazine sulphonic acid (para); phenyl salicylate (salol); phloroglucinol; phosgene in sealed tubes; phosphorus oxychloride; phosphorus pentachloride; phosphorus trichloride; phthalimide; phthalic acid; phthalic anhydride; physotigmine and salts; picramic acid; pilocarpine hydrochloride; pilocarpine nitrate; piperidine; piperine; piperonal; potassium carbonate; potassium permanganate; propyl acetate; propyl iodide; pyridine; pyrocatechol; pyrogallol (resubl.); pyrogallol mono acetate; pyrogallol tri-acetate.

Quinine; quinoline; quinone.

Raffinose; resorcinol; resorcinol acetate; rhodinol; rosaniline; rosaniline acetate.

Saccharin (see sulphobenzimide ortho); saccharose; safrol; salicin; salicylamide; salicylic acid cryst.; salicylic aldehyde; salol (see phenyl salicylate); sebacic acid; silver salt; Schaeffer salt coml. (see 2-Naphthol-6-sulphonic. acid);. soda, caustic; sodamide; sodium-p-amino phenyl arsonate; sodium butyrate; sodium cinnamate; sodium formaldehyde sulphoxylate; sodium formate; sodium glycero-phosphate; sodium hippurate; sodium hydrosulphite; sodium meta-nitro-benzene sulphonate; sodium naphthionate; sodium oxalate; sodium palmitate; sodium perborate; sodium peroxide; sodium phenol sulphonate; sodium valerate; sparteine; sparteine sulphate; starch, fat-free; strychnine cryst.; succinic acid; succinimide; sulphanilic acid; sulphindigotic acid (solution); sulpho-amino-benzoic acid; sulpho-benzimide (ortho); sulphonal; sulphur dichloride; sulphur monochloride; sulphuryl chloride, refined.

Tartaric acid cryst.; terpine hydrate; terpineol (liquid); terpineol acetate; terpineol butyrate; tetramethyl diamido diphenylmethane; thio-carbamide (thiourea); thiosinamine; thionyl chloride; thymol; toluene; toluene sulphochloride (ortho); toluene sulphochloride (para); toluene sulphonamide; tolidine (refined); tolidine (ortho); tolidine (para); tolidine hydrochloride (ortho); *m*-toluylene diamine; triacetin; trichlor-acetic acid; trichlor-meta-cresol; trichlorethylene; tri-cresyl carbonate (ortho); tri-cresyl carbonate (meta); tri-cresyl carbonate (para); tri-cresyl phosphate (ortho); tri-cresyl phosphate (meta); tri-cresyl phosphate (para); tri-phenyl phosphate; tri-nitro meta cresol; tri-nitro tertiary butyl xylene; trioxymethylene; tropine.

Urea; Uric acid.

Valeric acid; vanillin.

Xylene; xylyl-succinamic acid; xylyl-succinamide; xylidine.

zinc formaldehyde sulphoxylate.

(Research Chemicals which members of the Association are prepared to make if there is sufficient demand.)

α-Analine; aluminium ethoxide; amygdalin; amyl bromide (iso); anisidine (para); arabinose; azobenzene refined.

Benzonitrile; butyric acid (iso).

Camphor-oxime; conine; cresotinic acid (meta) refined (CH_3:OH:COOH=1:3:4); cresotinic acid (para) refined (CH_3:OH:COOH=1:4:3).

Dulcite.

Epichlorhydrin.

Fenchone.

Guanidine carbonate.

Inulin.

Mandelic acid; mannose; methyl bromide in sealed tubes.

Nitro-benzoyl chloride (meta).

Phenetidine (ortho) refined; propyl alcohol.

Ricinolic acid.

Teritary butyl xylene; tin tetrachloride; toluene sulphonic acid (para); tri-nitro xylene.

The Sugar Industry of France Since the War

Reconstruction of Industry in Invaded Regions a Slow Process---Factories 85 Per Cent. Destroyed

By T. J. MURPHY*

AS Chief of the Sugar Division, Engineering Section, of the War Damage Board, American Commission to Negotiate Peace, the author was assigned the task of estimating the damage done by the war to the sugar industry of France. M. Sailard, chief chemist of the Association of Sugar Manufacturers of France, was consulted in his splendid laboratory. M. Veuville, the president of the association, furnished a letter of introduction, which proved very useful. M. Barbarre, designer and builder of sugar factories; M. Gilbert, manager of the largest beet sugar factory in France, and M. Alexander, editor of the Journal des Fabricants de Sucre, gave helpful advice, and furnished invaluable data and statistics.

The extent to which the French sugar industry had grown before the war is shown by the fact that 7 per cent. of the capital invested in industry in the invaded regions of Northern France was placed in the sugar industry. The extent of the damage suffered is shown by the fact that, out of 217 factories in France in 1913, over 142 were damaged, and, for the most part, completely destroyed. Measured on the basis of production, in tons, 66 per cent. of the sugar industry of France was wiped out.

There were in operation in 1913 213 sugar factories; and in 1917 only 65. In 1913 there were produced 877,656 metric tons of refined sugar; and in 1917 only 185,000 tons. In 1913 the balance of the sugar trade showed 78,739 tons of surplus sugar exported; and in 1917 397,746 tons imported, with a decrease in consumption from 703,126 tons to 563,479 tons. The sugar shortage of France is about 716,132 tons per year since the loss of her factories.

The 142 sugar factories which were in the war area were damaged, on the average, to the extent of being 85 per cent. destroyed; to rebuild them or replace them at present prices of machinery and building materials would cost about $89,000,000. The land remains and building materials exist, but the grounds and buildings represent only about one-half of the value of the average beet sugar factory. The machinery and mechanical appliances represent the other half, or a value of $45,000,000, but their replacement from other parts of France is impossible for the present. The great steel mills, foundries, engine works, and factories where sugar machinery and equipment were made, were, for the most part, located in the same region, notably around St. Quentin, Lille and Douai, and these great industrial plants suffered the same fate as the sugar factories.

It is hoped that it will not be out of place to repeat here a portion of a report written by the author while still in France, which was quoted by Major Charles P. Wood, in the March issues of "Sugar":

"During the 1914 advance of the German armies very little damage was done to the sugar industry, but, on the other hand, due to the scarcity of metals and materials in Germany in 1917 and 1918, every factory which was behind the 1918 line of maximum advance was absolutely stripped of all copper, brass, bronze, belting, rubber and electrical equipment. The copper coils, brass plates, and bronze tubes of pans, evaporator effects, juice heaters, etc., were removed; sometimes by unbolting the bottom of the pan or effect, and then letting it fall to the floor below, and then removing tubes, coils, etc., through the bottom; and often by tearing away the insulation, and cutting a large section out of the side of the pan or effect by means of an oxyacetylene flame, and then removing the copper and bronze from the interior through this hole. The sugar-boiler's brass proof sticks, the brass stuffing boxes, the brass frames of peep glasses of pans, evaporator effects, etc., the copper-lined spouts and troughs of juice filter presses, all centrifugal screens and back screens, all brass and bronze bearings on engines, pulley shafts, etc., were removed by unbolting or breaking off. All electric generators, alternators, motors, distribution boards, etc., were removed, a loss which, in various cases, amounted to 15, 25, 50, and as high as 65 motors for one factory."

French Factory Practice.

The French factories were in general, good, and compared quite favorably with the general run of American factories. Machines were well made, well installed, and conservatively operated. In France a sugar factory works about 90 to 110 per cent. of its rated capacity. The beet-sugar factories of our largest American firm handle, year in and year out, about 170 per cent. of their rated capacity. Consequently, it can be seen that to produce a given quantity of sugar requires more machinery and equipment in France than in America. There exists a contrast between French and American methods in the matter of raperies or juice annexes. These annexes have boilers, cutters, and a diffusion battery, and pump the diffusion juice through a small pipe line to the central factory. In America very few juice annexes exist, probably only the one in Idaho; but in France they are quite general. The 142 factories destroyed in Northern France had 70 juice annexes which suffered the same fate. One factory, a 3,000-ton mill near Cambrai, had 14 juice annexes situated around the central factory, at distances varying from 1 to 15 miles.

Another contrast exists in the matter of product. While practically all the American sugar factories and refineries, including even the smallest beet-sugar factories in the West, produce white granulated sugar, the general run of French factories produced white crystals, or No. 3 sugar, which was shipped to a refinery. The refineries put out very little granulated sugar, their product being in the form of domino sugar cubes. The largest refinery in France puts all of its 1,500 tons per day through the "Adant" system, of which the product is 85 per cent.

*Paper read by Major T. H. Murphy before the Sugar Section of the American Chemical Society at Chicago Convention, September 9th, 1920, and published in "Facts About Sugar," Journal, New York.

domino, and the remaining 15 per cent. powder and small broken lumps, incidental to the manufacture of domino. The coast refineries, which handle the raw cane sugar from Africa and the French colonies, make principally the "pain de sucre," or sugar loaf, a hard, conical lump of refined sugar, weighing two kilograms. This product is demanded principally by the colonial trade.

Eventual Restoration Assured.

The French manufacturers and refineries make and sell whatever their trade demands; which, so far, has been principally the sugar loaf and domino; and it is quite likely that when bans are lifted, so that they can buy machinery and equipment outside, they will proceed to re-establish along the same general lines that existed before the war. Reconstruction presents enormous difficulties, and will doubtless entail long delays, but sooner or later the French factories will be rebuilt.

At the present time reconstruction in France is making enormous strides. Of the 7,000,000 acres of arable land laid waste by the war already over half has been again put under cultivation; 2,163 kilometers of railroad, together with bridges, tunnels and locomotives were completely destroyed, and to-day circulation has been restored over the whole. Out of 600 bridges destroyed, 475 have been rebuilt; out of 370 passenger stations destroyed, 200 have been rebuilt; out of 11,500 factories destroyed, 3,500 have been rebuilt and 3,500 are now under construction. In 1919 France had to import 150,000,000 bushels of wheat, and in 1920 she is having to import only 30,000,000 bushels.

This is really wonderful progress in reconstruction, but the sugar industry, because of its requirements in specially contructed machinery and mechanical appliances, because of the enormous amounts of copper, brass and electrical equipment required, has not been able to do so well. A communication from Monsieur Le Hay, president of the Association of Sugar Manufacturers of France, dated July 5, 1920, states that only 60 French sugar factories are now in working order.

THE MANUFACTURE OF CHEMICALS IN GREECE.

In a recent report of the Canada Trade Commissioner to Greece, W. McL. Clarke, some interesting data is given concerning the Greek chemical industry, from which we quote a few production figures:

Acids and Fertilizers.—Greece produces annually about 300 tons of nitric acid, 400 tons of hydrochloric acid, 20,000 tons of copper sulphate. Some 26,000 tons of superphosphates are also produced, Tunis phosphate being imported for this purpose.

Turpentine.—About 5,600,000 pounds of turpentine are produced annually in Greece, distilled from pine resin. Before the war Greece exported to Hamburg, Germany, some 1,000 tons annually, which was used for the preparation of synthetic camphor.

Explosives.—A company, known as the "Societe des Poudreries et Carthoucheries Hellenique," manufactures dynamite, other explosives and cartridges, with an annual production of about 100 tons.

Calcium Carbide.—A plant near Gorgopotamo, in Eastern Macedonia, employs 28 workmen and turns out 800 tons of calcium carbide annually.

Soap.—The manufacture of soap forms an important branch of the Greek chemical industry. In the peninsula proper, green sulphur oils, extracted from the olive stone, which are treated with carbon bisulphid for the purpose of removing the sulphur, are used. Caustic soda, rather than carbonate of soda, is also used, with the combined result that the soap is both dark and caustic. On the islands, however, the clearer oils and the carbonate utilized give a milder and whiter soap. There are seventeen soap plants in Piraeus, Athens and environments. The raw material, with the exception of the oils, is imported, and amounts to about 1,400 tons of carbonate of soda, 2,500 tons of caustic soda, and 600 tons of carbon bisulphid.

In his report Mr. Clarke points out that much development is needed in every line of manufacture in Greece, and quotes from the Minister of National Economy, who stated: "In our efforts to help ourselves and to strengthen our industries, we count on outside support, for it is from Canada and other industrial countries that we must draw our machinery, equipment, and those other essentials which we may require."

ONTARIO'S METALLIFEROUS PRODUCTION—FIRST NINE MONTHS, 1920.

Although the aggregate production of mines, smelters and refineries in the Province of Ontario for the nine months ending September 30th, according to the latest report of the Ontario Department of Mines, shows an increased valuation of over six million dollars as compared with the 1919 figures, developments during the past two months have been such that a proportional increase for the full year cannot be expected. Rainfall was so scanty during the late summer and fall that the power plants supplying Cobalt, Porcupine and Kirkland Lake have been unable to meet the requirements. A power shortage setting in now may be prolonged. Furthermore, the wholesale prices of commodities have declined abruptly, and industry and commerce are feeling the effects of this inevitable aftermath of the war. Labor, however, is becoming more plentiful ,and the cost of production is declining. Such circumstances are specially advantageous to the gold-mining industry, which has had to carry on during the war period under difficult conditions.

NEW PRESIDENT OF CANADIAN SALT COMPANY.

Sir Thomas Tait, of Montreal, has been elected president of the Canadian Salt Company, Limited, Windsor, Ont., in succession to the late Ernest G. Henderson. Sir Thomas Tait had previously been vice-president. Mr. G. Duck, who had been closely associated with Mr. Henderson in the company for the past twenty years, has been appointed manager.

TESTING ALBERTA COAL FOR WELDING PURPOSES.

Mr. M. L. Hyde, Alberta Government Heating Engineer, in a query column conducted by him in "The Manitoba Free Press," headed "How to Get Best Results in Burning Western Coal," states in answer to an enquiry that a coal known as "Mountain Park," obtained in the Yellowhead Pass district, gives very good results in smithy work. Coal mined at Hillcrest in the Crow's Nest Pass district, gives splendid results on light welding, though on heavy work, such as pieces four inches by three inches, it does not appear to have the staying qualities to give general satisfaction. Coal from Greenhill, McGillivray Creek, and International mines, coming from the same field as Hillcrest, deserve consideration for light welding. According to a test carried out at the Fuel Testing Plant, Department of Mines, Ottawa, on Alberta coals, with a sample from the Hillcrest Collieries, Limited, excellent results were obtained on welding work of bars of iron two inches by one inch, and when compared with Pennsylvania coals the Alberta coals were found to be generally superior for light welding.

Chemical Society News

Canadian Pacific Section Hold Joint Meeting With British Columbia Technical Association.

A joint meeting of the Canadian Pacific section of the Society of Chemical Industry and the British Columbia Technical Association, was held on Monday evening, October 25th, in the Board of Trade Auditorium, Vancouver, B.C., Mr. Noble W. Pirrie and Mr. A. S. Wootton being chairmen.

Mr. J. A. Dawson, Dominion Government Chemist, reported as delegate to the recent Banff meeting of the Engineering Institute of Canada, discussing the relationships between engineers, architects, chemists, etc., and the need for extending a more consolidated organization of such intellectual workers, to the other provinces of Canada.

Dr. R. H. Clark, of the University of British Columbia, was the first speaker in a symposium on "Chemistry in the Community." Under the title of "Academic Chemical Research," Dr. Clark pointed out that the University chemists are the pioneers in chemical discoveries, which are frequently the newly born babies that develop into giant industries, such as coal tar dyes, explosives, synthetic drugs, perfumes, etc. The importance of constitutional formulae was particularly emphasized.

Mr. G. S. Eldridge, consulting chemist and assayer, discussed the relationships of "Chemistry and Metallurgy." The dependence of modern civilization on the increased production of steel resulting from the discoveries of Bessemer, Siemens and subsequent metallurgical chemists, was used as an example of the importance of chemical analysis and control. Other illustrations, such as the more recent developments in ferro-alloys, and the electrochemical separation of metals at Trail, B.C., were given.

Mr. W. S. Barwick, of the Engineering Corporation, Limited, under the subject "Chemistry and Alloys," described various types of brasses and bronzes. Manganese bronze, more correctly described as manganese brass, is finding increased application in propellor blades for ships, pumps, etc. Other alloys containing aluminium, calcium, magnesium, etc., were described as to properties and composition with uses such as in aeroplane manufacture.

Mr. W. H. Hill, Dominion Agricultural Chemist, discussed "Chemistry and Agriculture," showing that progress in agriculture depends largely on knowledge of the chemical composition of plants, soils, fertilizers, insecticides, fungicides, etc. Civilization begins and ends with the plow.

Mr. C. J. Berkeley, Biochemist at Departure Bay Biological Station, gave a very interesting discourse on "Chemistry and Biology." The necessity for particular kinds of foods was explained in relation to growth and health, especially the action of "vitamines" and of glandular secretions. Mr. Berkeley described his present research work on the respiration of clams in the absence of air, and indicated the great importance of the problem in changing existing ideas about this fundamental chemical process. Applications of biochemistry to industry were instanced, such as the two new processes developed during the war period for the production of acetone from starch and from kelp.

Mr. Horace Freeman, Chemical Engineer and Secretary of the British Columbia Committees of the Advisory Council for Scientific and Industrial Research in Canada, briefly referred to his discovery while resident in Vancouver, of the process of making cyanide electrochemically from calcium cyanamide, and to its subsequent development on a large industrial scale at the works of the American Cyanamide Company at Niagara Falls, Ontario. Mr. Freeman then reviewed opportunities in the lumber, fish and mining industries of British Columbia, wherein the judicious application of chemical knowledge is essential to economic success. Much interest was aroused in the announcement that the Canadian Advisory Council for Scientific and Industrial Research, had made a grant of money towards carrying on an investigation of a promising electrochemical process for treating the complex zinc lead ores of British Columbia.

OTTAWA SECTION, SOCIETY OF CHEMICAL INDUSTRY.

A splendid program for the season of 1920-21 has been arranged by the Ottawa Section, Society of Chemical Industry. The opening meeting took place November 24th, when Mr. H. H. Claudet, Canadian Representative of the General Engineering Company, and Secretary of the Ottawa Branch of the Canadian Institute of Mining and Metallurgy, gave an excellent paper on "Mineral Flotation Processes." The officers of the Ottawa Section for 1920-21 are as follows: Chairman, Edgar Stansfield, M.Sc.; Secretary, S. J. Cook, B.A., A.I.C.; Committee—Fred J. Hambly, F.I.C.; J. T. Janson, B.Sc., A.I.C.; Prof. S. F. Kirkpatrick; Alfred E. Macintyre, Ph.D., and A. E. MacRae, B.Sc. The program, as arranged for the balance of the season, is as follows:

Dec. 9.—"The History and Manufacture of Helium," by R. T. Elworthy, B.Sc., A.I.C., Chemist, Mines Branch, Department of Mines. Mr. Elworthy was associated with Professor J. C. McLennan, D.S., F.R.S., in the splendid work done under the Admiralty Inventions Board during the war.

Jan 13.—'Vitamines and Their Relation to Dietetics and Health," by Dr. R. S. Stevens and Col. J. T. Janson, B.Sc., A.I.C. The most advanced knowledge regarding this subject will be reviewed by these two speakers.

Feb. 10.—"Cements and Super-Cements," by Mr. E. Viens, Chief Chemist of the Public Works Testing Laboratory. Mr. Viens' work on cement is well known, and his review of the subject will be interesting.

March 10.—"The Metallurgy of Cobalt," by Prof. S. F. Kirkpatrick, of M. J. O'Brien, Ltd. Prof. Kirkpatrick is one of the best-informed men in Canada on the subject of cobalt and its related ores.

Arrangements are being made by the committee to secure a number of motion picture films portraying various phases of chemical industries in Canada and the United States. At least two motion picture meetings will be held during the season in the Projection Room of the Department of Trade and Commerce.

Arrangements have been completed whereby Ottawa Section Associates may obtain copies of the "Annual Reports of Applied Chemistry" at the reduced price of $1.50. To non-members the price of these volumes is $3.

The Annual Reports furnish a complete and authentic review of the progress of industrial chemistry during

each year, and it is expected that many Associates will avail themselves of this unusually attractive opportunity.

Members of the Ottawa Section assuredly deserve credit for the enterprise they have shown in making their meetings attractive, and particularly for the interest the executive has taken in their Associate members.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

Minutes of the 2nd meeting, held on Friday, Nov. 19th, 1920, at the Queen's Hotel.

Chairman—Mr. Chas. R. Hazen.

Members and friends to the number of 45 met at the Hotel at 6.15 and enjoyed an excellent dinner.

During dinner Community singing was indulged in for the first time at a regular meeting of the Society, and what was perhaps lacking in artistic finish was more than made up for by the enthusiasm of those present.

Two solos by Mr. Kennedy were rendered in good style.

When the "King" had been toasted and the National Anthem sung the Chairman requested Dr. Skirrow, of Shawinigan Falls, to report the progress that had been made in the formation of the Baby Section of the Society in Canada.

From Dr. Skirrow's remarks it was judged that the "Baby" was likely to prove a pretty husky specimen in that they had already obtained about 50 full members and would probably have in the neighborhood of 25 associates.

Mr. Hazen then introduced Mr. David Gilmour, President of the Standard Chemical Company, the first speaker for the evening, whose address on the "General Survey of the Hardwood Distillation Industry" was given in masterly style.

Mr. Gilmour gave some very interesting statistics showing the growth of the industry since the building of the first plant at Fenelon Falls, about 1900, and pointed out the possibilities ahead of it in the production and marketing of the various commodities which were obtainable.

Mr. Gilmour said that although so far there had been very little progress made in the actual mechanical equipment of the plant, that would no doubt be rectified as the Research work broadened, and he felt that in the manufacture of formalin alone for the treatment of wheat for the prevention of "smut" in the Canadian North-West and in Japan for use in the Silk industry, and as a denaturant for alcohol, etc., the field ahead was a very great one.

Mr. Gilmour's talk to the members was an extremely interesting and enlightening one and was much appreciated by all present.

The second speaker, Mr. R. E. Gilmore, gave an extremely interesting paper on the "Crude Factory Practice," illustrated by slides showing detailed views of the ovens, condensers, charcoal cooling sheds, etc., and was followed by Mr. J. A. Wales, on the subject of the Refinery.

Mr. Wales' paper dealt with the manufacture of alcohol, acetone, etc., and his remarks were also made more clear by the aid of very fine slides. At the conclusion of the papers, Mr. Hazen opened the discussion, to be followed by Dr. L. F. Goodwin, Mr. H. J. Roast and Dr. Ruttan, the last mentioned proposing the vote of thanks to the gentlemen who had given such interesting papers.

As there was no further business, the Chairman then adjourned the meeting.

PLANS FOR ANNUAL MEETING, S.C.I., 1921.

It is now arranged that the annual meeting of the Society of Chemical Industry will be held in Montreal on August 29th and 31st, 1921. Shawinigan Falls and Grand Mere will be visited by a special train, and the party will be taken to Ottawa and Toronto. A day will be spent at the Canadian National Exhibition, including a visit to the new Chemical and Metallurgical Section. At Niagara Falls the party will be taken in charge by the American Chemical Society, and the New York Section of the Society of Chemical Industry. Joint meetings will be arranged in New York previous to the annual Chemical Exposition. This Exposition will be moved forward one week in order that it may coincide with the visit of the English and European chemists. At these joint meetings nearly twenty-five thousand chemists of Anglo-Saxon origin will be represented.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The November meeting of the Toronto section of the Society of Chemical Industry, held at the Engineers' Club, November 26th, was well attended, and in point of enthusiasm and interest was one of the best ever held under the auspices of the Toronto section. In the absence of the Chairman, Mr. M. L. Davies, who was unexpectedly called out of the city, Professor E. G. R. Ardagh, Past-Chairman, presided. Following the usual dinner at 6.30 the members and ther guests adjourned to the lecture room upstairs. Mr. Rothwell, the energetic local secretary was in his place and read the minutes of the November meeting, which on motion were adopted.

The speakers of the evening were then introduced in the persons of Mr. A. Neighborn of the Nichols Chemical Company, and Professor Bowman, London, Ontario, both of whom have been intimately associated with the manufacture of sulphuric acid in Canada for many years. Their subject was "The Manufacture of Sulphuric Acid in Canada," Professor Bowman dealing with the period of 1866-1899, and Mr. Neighborn from 1900 to present date. Tracing the growth of the industry from its start at London, Ontario, in 1866, Professor Bowman dealt particularly with the overcoming of prejudice on the part of Canadian consumers against Canadian made sulphuric acid. Many side-lights on the industry were given by Professor Bowman which did not appear in his paper, but they constituted a most interesting part of his address. Following the papers a discussion took place participated in by several members including Mr. W. A. P. Schorman of the British American Oil Company, Mr. R. J. Chute, of the Grasseli Chemical Company; Mr. A. H. C. Heitman of Chemical Products, Limited, Trenton, Ont.; Dr. Morden, Dr. Lash Miller; Mr. J. M Dickson of the Natonal Drug and Chemical Company; Professor J. W. Bain, and Mr. Alfred Burton. On motion of Mr. Burton a hearty vote of thanks was unanimously voted the speakers of the evening. In our January issue we hope to give the papers of Mr. Neighborn and Professor Bowman.

MANITOBA CHEMICAL SOCIETY

The third annual meeting of the Manitoba Chemical Society was held on Oct. 19th, under the chairmanship of Professor M. A. Parker. The main business of the evening was the reading of the Secretary's and Treasurer's reports on the season of 1919-20, and the election of officers for the coming year. The Secretary's statement showed that during the last season seven regular meetings had been held and that five papers were read before the Society. It was also remarked that the Society had offered a scholarship of fifty dollars in matriculation

chemistry, in order to stimulate and encourage the study of the science in the secondary schools of the province.

Dr. J. W. Shipley and Mr. E. L. C Forster, who had held the offices of Secretary and Treasurer respectively since the organization of the Society, declined to stand for re-election, and Mr A. W. Alcock and Prof. W. J. Geddes were elected to succeed them. The voting for the Executive Committee resulted in the election of Prof. Parker, Dr. Shipley, Mr. A. Blackie and Mr. W. A. Davidson.

At the conclusion of the meeting the members inspected the new Junior Chemical Laboratories of the University.

The second meeting of the season was held on Nov. 16th, when Mr. F. Pugh, Head of the Research Bureau of the T. Eaton Company's Winnipeg store, read a paper on "Textiles." Mr. Pugh's paper was illustrated by a large number of lantern slides showing micro-photographs of the various fibres which are used in the manufacture of textiles. A very complete set of specimens of the materials at different stages of manufacture were also exhibited. The speaker referred to the artificial silk industry and to the recent advances which have been made in the production of useful fabrics from wood-pulp.

CHANGE IN THE EXECUTIVE OF THE C.I.C.

Professor Lash-Miller has tendered his resignation as Vice-President of the Institute in order that a representative from the West may be amongst the officers thereof. As a result the following is the correct list of Vice-Presidents:

First Vice-President—Dr. Harold E. Bigelow.

Second Vice-President—Dr. Geo. Baril.

Third Vice-President—Professor A. Lehmann.

The Institute still has the benefit of the services of Professor Lash-Miller as a member of Council.

PAINT AND VARNISH SUPERINTENDENTS ORGANIZE FOR 1920-21.

The Paint and Varnish Superintendents' Club of Toronto have organized for the coming winter meetings. An increased interest is being shown, and firms in the vicinity are co-operating to make the club successful. The officers for the season are: Chairman, Mr. H. Chamberlain, of Lowe Brothers, Ltd.; Vice-Chairman, Mr. R. B. Eaton, of the International Varnish Company, Ltd.; Secretary, Mr. Holt, of the Glidden Varnish Company, Ltd.

CERAMIC MEN TO MEET AT COLUMBUS, OHIO.

The 1921 annual meeting of the American Ceramic Society will be held on February 21, 22, 23 and 24, at Columbus, Ohio, where the Hotel Deshler has been engaged as headquarters. The management of this new and commodious hotel have promised to reserve the ball-room and four other rooms on the same floor, so that the general meetings of the Society and the divisional meetings will be taken care of adequately.

Details of the entertainment are in the hands of the local committee, of which Professor A. S. Watts is chairman, and it is expected that the usual Section Q, or smoker, will take place on Monday night, with the banquet on Tuesday. Those who recall those delightful events at the Philadelphia meeting will not fail to be present this year.

The trips to be taken on the last day of the meeting will be replete with interest, as Columbus is situated at the very heart of the clay-working industry.

The literary programme, if it may be judged by past experience, will be filled with papers of a high degree of excellence. The arrangement of the programme is in charge of Mr. R. H. Minton, chairman of the Committee on Papers, and contributors should communicate with him. —American Ceramic Society, Office of the Secretary, Alfred, N.Y.

Overseas and Foreign Notes.

(Specially prepared by correspondents for The Canadian Chemical Journal.)

Vegetable Oils for Combustion Engines.

Mr. R. E. Mathot, President of the National Chamber of Consulting Engineers in Belgium, has been in charge, for the Ministry of Colonies of that country, of investigations being carried out in England as to the possibilities of the utilization in internal combustion engines of some of the vegetable oils available in the Congo and other Colonial regions. Tests have been made with such fuels as palm oil, cottonseed oil, and ground nuts oil, etc., which can be obtained in almost every part of the tropical zone, while mineral oils are only available along the pipe line routes. It is stated that the tests carried out so far by Mr. Mathot have produced some very good results, and very promising prospects for the future. Seeing that the sources of these vegetable oils are universal, the question might perhaps be taken up by other governments for examining the comparative results of vegetable and mineral oils in stationary engines and for marine power, and on inland waterways.

Increased Exports of Chilean Nitrate.

The Chilean Association of Nitrate Producers reports that the foreign demand for nitrate of soda during the year which began in July last is expected to amount to three million tons. Exportation by the Producers' Association in the calendar year 1919 amounted to 915,400 tons, as compared with over 2,000,000 tons shipped abroad in 1918. From January to July, 1920, however, exportation reached 1,481,200 tons, the highest figure hitherto recorded in a like period. The report estimates the producing capacity of the associated companies at 3,480,000 tons, while that of companies not in the association is placed at 657,800 tons, a total for Chile amounting to 4,137,800 tons. The importance of the industry as a national asset is shown in a recent report of the Ministry of the Treasury, which estimates that from 1880 to 1918 the amount received by the Government in export duties and from sales of land was approximately $700,000,000, or slightly more than 44 per cent. of the nation's total revenue.

Germany Continues Strong Assistance to Research.

At the instigation of Professor Wilhelm Ostwald, the famous German technical expert, the preliminary steps have been taken towards the foundation of an institute at Dresden, Saxony, for the development of the scientific study of "color," and for the adaptation of the results of that study to practical purposes. The experiments will be mainly based on the new principles of the color-phenomenon. For some time the German dye industry has been considering to what practical purpose Ostwald's theories can be put, with the result that already a fund of 14,000,000 marks has been placed at the disposal of the Color Institute for extensive experiments. The results of the investigation are jealously kept secret, with the object of springing the whole thing, when completed, on the world as a practical proposition, and to maintain Germany's supremacy in the world's dye markets. From such scanty information as has been available, scientists believe that,

if successful, the new system will revolutionize the dyeing industries.

Swiss Celluloid Industry Expanding.

There has been a remarkable development during recent years in the manufacture of celluloid in Switzerland, the German monopoly of the raw article having been broken during the war. The German manufacturers are unable to compete owing to the shortage of raw cotton and of camphor. During the past few months the Swiss industry itself has found it necessary to establish a plant for the manufacture of synthetic camphor from turpentine, and the artificial product is found to be much cheaper than the Japanese natural product, and equally satisfactory in use. The process of manufacturing celluloid is not without interest, nitro-celluloid, supplied wet, being dried by centrifugal machines, and the dry material, to which a certain percentage of alcohol is added, is then placed in large metal spheres, into which is poured the requisite amount of camphor. These spheres resemble, internally, butter churns. They are hermetically sealed, and during the process of churning the pulp the alcohol is sucked out and partially recovered for future use. The thick paste that passes out of the metal spheres is filtered under pressure and given the desired coloring. It is then molded, pressed or rolled into the desired shape, and eventually polished by being pressed against nickel-plated metal surfaces.

Great Possibilities for Kauri Gum Industry.

Recent research work in connection with the kauri gum industry of New Zealand has shown that the potentialities of the gum oil industry are remarkable. It is estimated that a swamp may contain from 200,000 to 300,000 gallons of oil per acre, worth 2s. 6d. per gallon, and producing from £25,000 to £37,500 gross value. The oil, which is at first crude, is by fractional distillation subdivided into a number of distillates, which, in turn, produce a variety of oils. The first or lightest oil is a benzine or motor spirit; the next a very valuable solvent oil for working rubber, etc.; then a paint oil, followed by turpentine, and next lubricating oil. The residue, which is very small, is fuel oil.

University May Operate Glass Factory.

The Department of Glass Technology at the University of Sheffield has been offered the option of purchasing a glass factory in that city, with a commodious and fairly modern plant, and it is likely that this will be accepted, this being the first occasion on which a University has become the owner of a factory in full working order. If the option is exercised it is proposed to transfer the bulk of the research and commercial work and the large-scale glass-melting to the factory, and to use the existing premises for teaching purposes and important research work.

Trade Notes.

Exports of British-made chemicals, drugs, dyes and colors from the United Kingdom during the nine months ended September 30, 1920, amounted to £30,591,146, as compared with £19,171,383 during the corresponding period last year. Imports of such commodities during the same period rose from £27,451,437 for 1919 to £46,595,700 this year.

Under an Act recently passed in the United Kingdom, gas will in future be sold at so much per therm, instead of per thousand feet. A therm is the name given to 100,000 British thermal units. The first distributor of gas to announce its therm charge is the South Metropolitan Gas Company in London, which from the date of reading the meters for the Michaelmas quarter will charge 10½d. per therm. Their gas is declared to contain 550 British thermal units per cubic foot.

The Federation of British Industries announce that they will put in operation, under the control of an expert committee, a scheme for the improvement of fuel practice in industrial undertakings, with the object of reducing production costs and conserving coal resources.

The South African petrol substitute, "Natallte," which was first commercially manufactured some three years ago, had many difficulties to encounter in regard to packages and denaturants, but the demand has now grown considerably. The efficiency has been enormously increased by the introduction of new denaturant, and the manufacturers are now endeavoring to cope with the demand by installing additional plant. "Natalite" is regarded as a real factor in the motor fuel trade.

The Stockholm "Svenska Dagbladet," in an article on the Swedish system for storing benzine, known as the "Mack" system, says that this method, which is used almost exclusively in Sweden, has proved most efficient. The cisterns are provided with appliances which register automatically and accurately the quantity of oil in them and the quantity drawn. The apparatus is manufactured at the Mack Works at Midsommarkransen, not far from Stockholm.

According to a Swiss technical paper there are openings for trade at the present time in Java for soap, perfumery, aniline dyes, paints, varnishes, chemical products, medicines, and other lines which should interest Canadian manufacturers now that there is a direct service to the East Indies from both Eastern and Western Canadian ports.

The South African Railway headquarters at Johannesburg are in the market for red oxide paint, in paste; anti-friction grease, resin oil and lime, or a fine mineral anti-friction grease or a combination of lime resinate and mineral anti-friction grease; toilet soap, yellow soap and soft soap.

Sir Charles Bedford, lately of the Indian Medical Service, declares that the potentialities of India, and especially of the deltaic areas in Bengal and Burma, for the production of fuel alcohol, are unrivalled even by China. Sir Charles is now in India pursuing his investigations in regard to this industry.

An amalgamation has been brought about between the Electrolytic Zinc Company and the Read Rosebery Company, in Tasmania, two concerns concerned with the manufacture of zinc by the electrolytic process in Australia, which, it is thought, will enable them to compete on satisfactory terms with the Anaconda Company in the United States and with the Consolidated Mining and Smelting Company at Trail, B.C.

The Anaconda Copper Mining Company expects to begin the production of a superphosphate fertilizer in the near future. By manufacturing a fertilizer containing 48 per cent. of the available phosphoric acid, the company is of opinion that the product will be available to compete with the Eastern-made fertilizers.

Many ironmasters, both in Great Britain and the United States, are making cement from blast-furnace slag, the

product being equal to the best obtained from other sources, if produced in the proper manner.

The Board of Trade in London is endeavoring to bring about the amalgamation of the British Chemical Trades Association and the Chemical and Dyestuff Traders' Association.

Mining and Metallurgy in British Columbia.

The Nickel Plate mine at Hedley, which has been producing between twenty-five and thirty thousand ounces of gold annually, or, roughly, about one-fifth of the production of the province, has been closed for an indefinite period. G. P. Jones, general manager of the mine, has made the following statement: "During the World War, we continued operations at Hedley, as we felt it to be our duty not only to British Columbia and the Allies, as they needed gold, but also as a moral obligation to the people of Hedley. After the armistice we continued to operate, thinking all costs, including supplies, etc., would come down and allow us to make a fair profit. We have been disappointed in this conclusion, and find that we cannot earn reasonable dividends under existing conditions and maintain our ore-reserve. We have accordingly recommended the board of directors that the property be temporarily closed down until conditions change. This will probably mean a shut-down of a year. The mine, mill, and other plant should be in good condition to start up when conditions justify it. We feel that under pre-war conditions, or even 20 per cent. thereof, we can earn good dividends. We have been hoping that the government would take some action to encourage gold production, but beyond the introduction of a measure to the legislature nothing has been done."

In explanation of the above it might be well to say that on two or three occasions the company has warned the men that it would be impossible to meet their demand for increased wages and continue operations, yet the men have insisted on increases and either their demands were met or a compromise made. The company has developed a large ore reserve, and rather than run the mine purely for the benefit of the men, it has decided to close the property until such time as conditions allow it to make a profit from the ore reserve it has developed.

Good Season Expected at Premier.

H. A. Guess, mining engineer for the American Smelting and Refining Company, paid a visit to the Premier mine, in the Salmon River district, at the commencement of November. The Guggenheim interests, which control the smelting company, own a two-fifths interest in the Premier. Mr. Guess stated that he was more than satisfied with the result of development at the mine. Already a small shipment of ore has been made this fall, and it is expected that during the winter fully 3,000 tons of high-grade ore will be shipped to the American Smelting and Refining Company's smelter at Tacoma. This amount of ore will have a value of between $800,000 and $1,000,000. A large quantity of low-grade has to be mined in obtaining this high grade, and the low grade will be milled as soon as the combined concentration and cyanide plant is completed. The construction work on this plant has been delayed on account of the wretched condition of the road to the mine and the impossibility of hauling heavy machinery over it. The machinery is on the wharf at Stewart, and it will be possible to take it to the mine as soon as there is sufficient snow to permit of good sledding. The water-power plant will be finished early in December.

Bentonite Deposit Examined.

Hugh S. Spence, of the Mines Branch, Ottawa, made a flying visit to Merritt, B.C., to examine a deposit of bentonite. It appears that the British Government had asked the Canadian Government for the mineral and a sample properly labelled was found in the museum at Ottawa, hence Mr. Spence's visit. A nine-foot deposit, which seemed to be of considerable extent, was found, and a large sample of it was shipped to the department laboratory.

Britannia Mining Mill Closes.

Owing to the marked drop in the price of copper, the Britannia Mining & Smelting Company has closed its mill, but will continue development work at the mine. This is a decided blow to the copper-mining industry of the province. Last year the Britannia mine, which is situated on Howe Sound, produced 17,250,000 pounds of copper, 98,600 ounces of silver, and 4,200 ounces of gold while the total copper production of the province was less than 42,500,000 pounds. During the last few years the Britannia has produced about one-third of the copper output of the province. The Britannia employs between six and seven hundred men, about half of whom have been dropped from the pay-roll, and if conditions do not justify the restarting of the mill within the next two or three months it is probable that a further number of men will have to be discharged. The facts to be faced are that the mine cannot produce copper profitably at less than 15 cents per pound, so unless either the price of the metal rises or working costs fall the Britannia is likely to remain closed. Closely following the closing of the Nickel Plate mine, at Hedley, it will tend to make the miners realize that increased wages and decreased production are things that do not keep each other company for any length of time.

WOOD ALCOHOL PLANT FOR PACIFIC COAST.

On November 9, the Acetate Products, Ltd., completed the purchase of the Liverpool Cannery plant, at South Westminster, B.C., and will commence at once to erect a plant for the manufacture of wood alcohol, acetate of lime, charcoal, creosote, and other wood-tar products from alder wood that will be obtained from the reaches of the Fraser and Pitt Rivers. It is said that this is the first plant of its kind on the Pacific Coast and that there are only two others in the Dominion, one in Ontario and the other in Quebec. Special machinery for the refinery will be imported from the East, and general-purpose machinery will be purchased locally. The company has opened an office in Vancouver.

The Liverpool Cannery was last operated by the Peterson Construction Company, which canned vegetables and fish. The concern went into liquidation, Wilson & Wilson, of Vancouver, being appointed liquidators. For the last two years the plant has been idle.

A NEW PATENTED WALL-BOARD.

The Pacific Roofing Company recently had an unusually interesting display of wall-boards in the windows of the Vancouver Daily World. These wall-boards had been made by a patented process from sawdust and calcined magnesite, the binder presumably being magnesium chloride. The Pacific Roofing Company owns a magnesite quarry near Williams Lake, on the Pacific Great Eastern, and it proposes to erect a plant near Vancouver, where the magnesite will be calcined and the wall-board produced. The specimens exhibited were made in an experimental plant. The finished wall-boards are said to be fireproof and moisture-proof, and may be either painted or kalsomined. They may be nailed in place, like ordinary wood.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Process of Extracting Alkalis from Silicates.
Richard C. Hills, 202201, July 27th, 1920. A mixture of silicates, $CaCO_3$ and $CaCl_2$, is roasted, the chlorides are leached from the roasted product and the $CaCl_2$ is separated from the alkali metal chlorides by dissolution with alcohol.

Treatment of Sulfite Liquor.
Carleton Ellis, 202311, July 27, 1920. A product adapted for use as a binder for briquetting, as a road binder or a tanning agent, is made by only partially neutralizing the acidity of sulphite waste liquor and then drying the liquor by evaporation or by atomization with hot gases.

Process of Recovering Potash from Silicates.
Robt. S. Edwards, 202319, July 27, 1920. K is extracted from silicates by heating to fusion a ground mixture of the silicate NaCl and a hydrated base, and then further reducing the product by continuously introducing the hot product into an aq. medium. The dehydrated base from the first reaction is rehydrated in the second reaction and the heat thus developed with the physical heat of the product further reduces the product.

Conversion of Bichromate or Chromate of Potash or Sodium to Chromic Sulphate.
Frank M. Mooney, 201818, July 13, 1920. The CrO_3 produced by the action of H_2SO_4 on $Na_2Cr_2O_7$ is freed from Na_2SO_4 by refrigeration to about O° F. and the solution is treated with SO_2.

Producing Hydrogen.
C. Bosch, A. Mittasch and E. Beck, 204628, October 5, 1920. A mixture of CO and steam is passed over a catalyst containing a metal of the Fe group and an oxide of Cr.

Motor Fuel.
Thos. J. Midgley, 204595, October 5, 1920. A fuel consists of kerosene, benzol and an anti-freeze compound, such as toluol.

Purification of Sulphur.
Jno. J. Hood, 204493, October 5, 1920. S is purified by passing liquid S through ignited Al_2O_3.

Phosphoric Acid.
F. C. Schmitz, 205159, October 26, 1920. A mixture of phosphatic material, a flux and a reducing agent is subjected to a high temperature, oxidizing the gas liberated to form P_2O_5 and passing the gases through a liquid to remove solid impurities and then through an absorption tower to collect the acid.

Metallic Catalyst.
W. P. Schuck, 204612, October 5, 1920. A black, flaky, non-oxidizable powder containing an active sub-oxide of Ni is produced by evaporating a solution containing in each cc. .1716 gm. of $Ni(NO_3)_2$ and .25 gm of sugar at a suitable temperature in an inert gas, and then decomposing the resultant by heat.

Phosphoric Acid.
Frank S. Washburn, 204580, October 5, 1920. P_2O_5 is produced by charging a portion of a mixture of mineral phosphate and silicious material into a furnace, charging a second portion of the mixture to the furnace above the first portion, adding C to the first portion and raising the temperature of the first portion to liberate CO and much of the P present, while permitting the evolved gases to rise through the second portion of the charge; adding air to the gases and igniting the CO present to preheat the downcoming charge. Apparatus is also specified.

Oxidizing Ammonia.
C. L. Parsons and L. C. Jones, 205, 204, Nov. 2, 1920.

Process For Oxidizing Gases.
F. C. Schmitz, 205722, Nov. 16, 1920. Gases are oxidized by subjecting the flowing gas to the action of an opposing current of O. This method is specifically applied to the manufacture of P_2O_5.

Recovery of Tar and Ammonia From Coal Gas.
C. Still, 206166, Nov. 30, 1920. The gases are cooled by direct contact with water to separate the tar, after intermediate cooling the gases are reheated with the water previously used for direct cooling and then conducted through a saturation bath for absorbing the NH_3. The gases are then further cooled.

Extraction of Lead and Zinc From Their Ores. F. E.
Elmore, 205829, Nov. 23, 1920. Pulverized Pb Zn sulfide ores are heated with sufficient strong HCl to convert the Pb to $PbCl_2$, the mixture is cooled and washed with cold water to remove excess of acid and soluble impurities, the $PbCl_2$ is extracted from the mass with aq, $PbCl_2$ solution or $PbCl_2$ solution in brine and the $PbCl_2$ is heated with H_2SO_4, the HCl evolved is dissolved in water and the solution formed used for treating a further batch of ore.

Cleansing of Ferrous and Non-Ferrous Metals, S. R.
Mason, 205546, Nov. 9, 1920. Metals to be cleansed are submitted as electrodes to the action of an a.c. in an electrolyte consisting of 32 gms of cyanide, 1 litre H_2O, 4 grams NaOH and 8 grams of grape sugar.

Fuel.
Jos. B. McGraw, 205,334, Nov. 2, 1920.

Process of Treating Cymene.
C. E. Andrews, 204768, Oct. 12, 1920. To material comprising cymene, terpenes, water and dissolved SO_2 sufficient quick-lime is added to combine with all the water and SO_2, the precipitate is separated from the liquid organic matter and the latter is dissolved in H_2SO_4. The mixture is cooled to about O° C. and maintained at that temperature while a nitrating mixture of H_2SO_4 and HNO_3 is added during agitation of the mixture. The reaction mass is added to a large amount of water shortly after all the mixed acids have been added, the oily material containing mono-nitro-cymene is separated and reduced to mono-amino-cymene by for example Fe and HCl.

Process of Oxidizing Organic Aromatic Bodies.
C. E. Andrews, 204780, Oct. 12, 1920. Organic aromatic compounds are oxidized by heating the compound with H_2SO_4 and a catalyst containing V or Mo, i.e., naphthalene is heated with H_2SO_4 in the presence of a V catalyst to produce phthalic anhydrid.

Synthetic Manufacture of Thymol.
C. E. Andrews, Can. 204773, Oct. 12, 1920. Amino cymene is boiled withglacial acetic acid foi 15 to 20 hours to substitute the acetyl group for the amino group, the product is nitrated whereby the nitro group enters in a position meta to the methyi group. The remaining body is heated with HCl until dissolved and on cooling the hydrochlorid of para nitro amino cymene are produced. This material is diazotised and the diazo body reduced by boiling with alcohol, the nitro group of the resulting compound is reduced with Fe and HCl and the amino compound diazotised by treating with $NaNo_2$ and the product boiled with water to produce thymol which is separated from the solution by steam distillation or by extraction.

Dimethyl Diisopropyl Benzidine Azo Dyes,
C. E. Andrews, 204,774, Oct. 12, 1920.

BOOK REVIEWS

"PLANTATION RUBBER AND THE TESTING OF RUBBER."

By G. Stafford Whitby. Longmans, Green & Co., London and New York; pp. 547. Price, $9.50.

The work is divided in two parts. The first treats with the preparation of plantation rubber, and the second with the testing of rubber. It is stated, and will be generally maintained by those most familiar with the rubber industry, that, in spite of the tremendous increase in the production and general use of rubber and articles containing rubber, the physical properties have not yet received that amount of exact experimental study which might be considered due from the importance of the subject and the uniqueness of the properties. It is possible that the chemical field and the field of synthetic production has received more attention, although it has by no means been fully covered. Some idea of the amount of work accomplished in production and testing may be gained by the references made in this work.

The headings in Part I. of the book are: (1) The Rubber Tree and Extraction of Latex; (2) Coagulation of Latex; (3) The Resin; (4) The Protein; (5) Collection and Coagulation at Factory; (6) Crepe; (7) Sheet; (8) Maturation; (9) Variation.

In the testing of rubber the various properties examined are fully discussed. Stress-strain relations, tensile tests, vulcanizing tests are outlined. Chapters are presented on: Progressive changes in vulvanization, comparison of raw rubber samples, stability of state of cure, technical mixes, viscosity determination, cycles of extension and retraction, hysteresis, elastic after-effect, relations of thermal, optical, electrical and mechanical properties, Poisson's ratio. The whole is supplemented by a most complete bibliography of references to original literature.

"THE MINERAL INDUSTRY DURING 1919."

By G. A. Roush and Allison Butts. Vol. xxviii. 902 pp. McGraw-Hill Book Co., New York. Price, $10.00.

The 1919 Volume of this valuable annual contribution to the literature relating to mineral production is now

available. The production of this series is a commendable thing. Primarily attention is given to progress in the United States and Canada. World statistics are presented, but details of foreign developments must remain for the most part rather slight. The method of having chapters written by individuals who have special knowledge or opportunity to survey a particular field is continued.

A series of chapters arranged under mineral names and in alphabetical order marks the sequence. It need only be said that the usual care has been shown in gathering and presenting statistics and information relating to metallurgical processes. The whole shows a uniformity not always obtained when a number of individuals collaborate.

In each volume some topic of more than usual interest receives special attention, and in the chapter on Gold and Silver, a very full discussion of the present world method of financing with gold is given. Here will be found information stating clearly a mass of details, causes and effects relating to international trade and currency values. As we are still in the throes of international exchange fluctuations of great moment, this review makes valuable history and pleasant reading.

"HYDRO-ELECTRIC DEVELOPMENT IN ONTARIO."

By E. B. Biggar. 202 Pages. Biggar Press, Limited, Toronto. $2.00.

Mr. E. B. Biggar is well known in Canada through the various trade and industrial papers which have been initiated and developed through his enterprise. His contribution to the railway question as author of "The Canadian Railway Problem" is well known. The present work places in sequence much history and statistical data that has remained scattered in reports and in the memories of those who were active in the early days of Hydro-Electric development in the province. Mr. Biggar has gathered this information, bringing it up to date so that for the first time it is possible to review in short form the whole history of the project.

At a time when, from the industrial standpoint, the development of electric power is so vastly important, and has become and will remain a large part of the work of the Government, this contribution to the literature will allow everyone to be well informed and makes a suitable reference for library and office purposes.

"PAPER AND ITS CONSTITUENTS."

By Henry A. Bromley. E. & F. N. Spon, Ltd., London. 228 pp. 16/.

This is a manual of information and technical methods involving a description of cellulose and paper-making fibres, and a considerable amount of chemical data relating to the examination of raw materials of all kinds as used in paper making. This includes bleaching agents, sizing agents, mineral pigments, synthetics, dyestuffs, lake pigments, water analysis.

The microscopy of paper receives due attention, and various means of studying all properties of different papers are taken up. The book does not duplicate many others in this field, and is of a type valuable to the control laboratory or the technical student.

"ELEMENTARY CHEMISTRY FOR COAL-MINING STUDENTS."

By L. T. O'Shea. Longmans, Green & Co., New York. 299 pp. Price $3.00, at New York.

This is a book for students, and is a worthy effort at presenting a general knowledge of chemistry, as it might be applied by a worker or manager in a coal mine. It is not a text-book of chemistry, but rather a compilation of those parts of chemistry which relate to the coal-mining industry. Those workers who are studying for higher certificates which will qualify them for advancement in the mining field, will find it exceedingly helpful.

The sequence of chapters indicates the method of presentation. Air, gases, combustion, hydrogen and oxygen, are fully discussed. A chapter is devoted to sulphur. Naturally a full presentation of carbon compounds is given, and a special chapter on gas compounds of this element. The subjects of flames, safety lamps, explosives, explosive mixtures of gases, and gas data find full treatment.

The book can be heartily recommended to any engineer or coal miner whose daily life and work is connected with these applications of chemistry.

"EMINENT CHEMISTS OF OUR TIME."

By Benjamin Harrow. D. Van Nostrand Co., New York. Price $2.50.

This book is written in the interests of a better knowledge of the lives of outstanding chemists. The work accomplished by these men and women is treated from the personal standpoint and in the light of many incidents not usually known to the average chemist. An inspiring series of pictures is drawn. Eleven names are treated, as follows: Perkin, Mendelleff, Ramsay, Richards, van't Hoff, Arrhenius, Moissan, Madame Curie, Victor Meyer, Remsen and Fischer.

Chemical literature is enriched by such contributions, and it is by reading such works that inspiration for the struggle to attain is brought to the younger generation. It is well for the chemist to know his family tree.

CATALOGUES AND REPORTS RECEIVED.

Diamond Fibre and Its Uses.—This is a booklet issued by the Diamond State Fibre Company of Canada, Ltd., Toronto, Ont., explaining the varied uses to which their product, Diamond Fibre, may be put. The earliest patents on vulcanized fibre were granted in 1859 to Thomas Taylor, inventor and chemist. Among the pioneers in this unique industry, which has since grown into such large proportions, were Henry Mendinhall and Edward Mendinhall Taylor, the latter of whom founded the Diamond State Fibre Company, and, after improving the material and processes, started its manufacture at Wilmington, Delaware. The business developed rapidly, until to-day the company operates eight large plants and maintains offices and warehouses in the principal industrial cities of the world. The rapid development of the company and the growing use of the products it manufactures constitute an important chapter in the history of modern industry.

The properties of the fibre are well outlined in the booklet. It is made from cotton cellulose, chemically hydrated, and is produced in three primal forms—sheets, rods, and tubes—which are then fabricated into special articles such as trucks, barrels, boxes, cans, etc., which are listed in another booklet, "Diamond Fibre and Receptacles." The Toronto plant handles Canadian business, and the booklets should be of interest to any manufacturer or wholesale dealer of chemicals.

The Topley Company, Ottawa, Canada.—The Will Corporation was formed in January, 1919, to take over the chemical department of Bausch and Lomb Optical Company, and the Topley Company, Ottawa, announce that

they are the Canadian representatives for the Will Corporation, as they have also been in the past for Bausch and Lomb. The Topley Company have a catalogue published, which will no doubt prove of assistance to every laboratory man. All the well-known Bausch and Lomb products are shown, including colorimeters, microscopes, refractometers, etc.

Molecules and Man.—This is the title of a booklet by Robert E. Rose, Ph.D., and issued by the E. I. Du Pont, De Nemours & Co., Wilmington, Delaware. It is not a trade publication in the sense that the company's name does not appear in the text, but it contains ideas that are original, and will at once appeal to almost any chemist. It shows the relation between molecules and the products of chemical plants, and explains the relation between the dye and explosives industries.

News Items

British Columbia.

Barnett—The Pacific Guano Co., composed principally of returned soldiers, have been granted a loan of $5,000 by the Provincial Government of British Columbia. The company have a plant at Barnett, B.C., and have invested $23,000 in their proposition.

Victoria—A new company, Canadian Abrasive Paper Co., Ltd., will commence the manufacture of sandpaper by a process developed by Mr. J. L. Near. The machinery for the plant will be made in B. C. Sand flint and emery paper, at present imported into Canada to the amount of over $500,000 per annum, will be made. Paper will be obtained from Ocean Falls Mills, and extra hard flint quartz and garnet stone from deposits located in the province.

Manitoba.

Winnipeg—The Waldorf Paper Products Co., who operate a plant in Winnipeg for the conversion of waste paper into useful products, are erecting an addition to their stock house at a cost of $20,000. Electric conveyors, baling machines and sorting equipment are being installed at an approximate cost of $12,000, and from such improvements expect to double their output. The paper mill connected with the company consumes 140 tons of waste paper stock daily.

Ontario.

Hamilton—The Dominion Foundries and Steel, Ltd., are making a very important addition to their plant by installing a universal plate mill, 27 in. x 40 in. x 72 in. It will be the only mill of its kind in Canada and will cost $1,500,000. It will roll universal plate 40 in. wide and sheaved plate 66 in. wide. A manipulator has also been installed to make billets and blooms of the larger sizes used by machine shops. The company intend to increase their output monthly from 5,000 to 15,000 tons when operations commence in the new mill next month.

Welland—The plant of the Dillon Crucible Alloys, Ltd., has been purchased by the Canadian Atlas Crucible Steel Co., Ltd. The well-known "L-XX" brands of high speed steel, also carbon and special alloy tool steels wil now be made in Canada.

The Electric Steel and Metals Company, controlled by the Electric Steel and Engineering, with branches at Lindsay and New Liskeard, have closed down their Welland plant, due to the unfavorable market conditions.

Toronto—The Marconi Wireless Telegraph Company of Canada has been consolidated with the Canadian General Electric Company. Wireless patents controlled by the General Electric Company will be developed, as the necessary capital will now be forthcoming. The Marconi Company of America has also affiliated with the General Electric Company of America, a new wireless company being formed of the combined interests known as the Radio Corporation of America.

Baldwin's, Limited, put into operation, commercially, on October 4th, the first of their tin-plate rolling mills, employing 500 workmen. It is proposed to have eight mills in operation eventually.

Quebec.

Montreal—The Mansuan Pulp and Paper Co., Ltd., have been incorporated to develop the pulpwood timber limits on the St. Maurice River. The limits secured adjoin those of the Laurentide Company, Belgo Canadian Pulp Company, and the Brown Corporation, and are virgin. Power will be obtained from Allard Falls, on the St. Maurice, above La Tuque, from which 38,000 h.p. can be developed. The 100-ton mill contemplated will require 9,000 h.p.

The Hammermill Paper Co., of Erie, Pa., has acquired all the assets of the Matane Lumber and Development Railway, including timber lands, etc., on the rivers Cap Chat and Matane, on the south shore of the St. Lawrence. These will be used as a pulpwood supply for their Erie mills.

Thetford.—Fraser, Brace & Co. have a contract for the Asbestos Corporation of Canada for the removal of 600,000 cubic yards of overburden at the King mine, Thetford, so that mining operations may be extended. The soil and sand will be removed by a hydraulic transport system from the mine to a dump across the Thetford River, a distance of a mile and a quarter. This work will uncover an area of asbestos-bearing ground 1,300 feet by 1,000 feet, previously proved by diamond drilling. Drilling operations have assured reserves for over thirty years at the present rate of mining.

Coleraine.—The Mutual Chemical Company of Canada have sunk the shaft at their chrome mine to 200 feet, though all mining at present is done on the 200-foot level. The lens of chromite on which they are now operating appears to be about 500 feet in its longest dimension. Their new concentrator is giving good results and shipments of chrome concentrate have been continued during the past summer. The mine is situated near Caribou Lake, between Black Lake and Coleraine. The J. V. Belanger Mining Company, which is working the chrome property adjacent to that of the Mutual Company, started their new concentrator early in July, and it has been in continual operation ever since. Their mill has a capacity of 180 tons of ore per day.

LARGE INCREASE IN NUMBER OF OIL-BURNING VESSELS.

Probably the most interesting part of the annnal report of Lloyd's Register of Shipping is that dealing with oil fuel and oil engines. During the year ended June 30, 1920, of the new ships classed, no less than 426 vessels were fitted for burning oil fuel, almost double the number for the previous year. A very large number of steamers which have previously burned coal have also been listed in the annual report as being converted into oil burners. The report also shows much development in the use of oil engines. During the year under review by Lloyds, 28 new vessels of 79,805 tons are classed as having been fitted with such engines, and there are at present under construction upwards of 150 sets of Diesel engines and about an equal number of sets of oil engines of other types, about half of which are being built in the United Kingdom. The report also shows that oil engines are being used in large vessels as emergency sets, the largest being one of 16 cylinders for the "Glenogle," a twin screw vessel of 9,150 tons. The largest oil engine vessel completed during the year was the "Africa," of 8,597 tons. The number of firms manufacturing oil engines has increased considerably.

CHEMICAL FERTILIZER PLANT FOR WELLAND.

The Cross Fertilizer Company, Ltd., Sydney, N.S., has acquired a site of fifteen acres at Welland, Ontario, for the construction of a plant costing about $250,000. Construction will commence in the spring, and it is hoped to have the plant in operation by next fall. Sir William Cross, president of the company, stated that the company had been unable to obtain a sufficient supply of raw material in the form of slag from the steel work there to meet the demands made upon its Sydney plant. At the Welland plant, he stated, fertilizer would be produced by chemical processes only, referring, no doubt, to ammonia and potash fertilizers. The new plant will be operated under a separate charter, and will be known as the Scottish-Canadian Fertilizers, Ltd., the Ontario manager to be Mr. A. L. Smith.

PRODUCTION OF BENZOL AT STEEL OF CANADA PLANT.

The benzol plant, which was installed during the year at the plant of the Steel Company of Canada, Ltd., Hamilton, Ontario, is operating successfully, and is at present producing 4,000 gallons of benzol per day, the product being used largely as a mixture for motor fuel.

CANADIAN TRADE IN CHEMICALS AND ALLIED PRODUCTS.

IMPORTS

Item	September 1919	September 1920	Six Months Ending September 1918	Six Months Ending September 1919	Six Months Ending September 1920
	Pounds.			Pounds.	
Acid Boracic	27,605	52,354	215,580	233,317	205,065
Acid Hydro fluo-silicic	2,589	.....	400	4,513	1,231
Acid Hydrochloric	9,388	3,627	62,138	18,881	27,340
Acid Nitric	6,452	30,574	69,432	32,615	71,011
Acid Sulphuric	232,244	13,966	5,011,003	2,033,366	279,917
Acid Oxalic	12,879	10,959	57,682	68,876	100,678
Acid Tannic	1,010	212	20,127	7,099	16,611
Acid Tartaric	39,815	14,783	145,304	256,973	368,099
Total Invoice Value of All Acids including above:—					
United Kingdom	$ 42,376	20,424	99,584	222,178	333,101
United States	40,304	31,582	334,332	223,452	286,901
Other Countries	2,102	.....	22,040	18,041	15,422
Total Values for Drugs, Medicinal and Pharmaceutical Preparations, including Caffeine, Cocaine, Codeine, Morphine, Nicotine, Opium, Quinine and Strychnine:—					
From United Kingdom	$ 80,001	79,819	411,053	516,793	679,662
From United States	126,635	142,350	707,639	794,912	868,837
From Other Countries	29,427	28,830	177,647	223,832	279,789
Total Value of Dyes and Tanning Materials:—					
From United Kingdom	$ 24,061	105,336	65,584	147,156	441,368
From United States	347,976	427,599	1,685,858	1,784,562	2,962,969
From Other Countries	66,162	57,551	151,440	158,974	270,561
Total Value of Fertilizer Materials:—					
From United Kingdom	$	11,650	30	589	45,203
From United States	93,252	652,645	1,904,936	479,129	2,250,794
From Other Countries	.....	182,624	566,479	.....	360,934
Total Value of Paints, Pigments and Varnishes:—					
From United Kingdom	$ 16,928	59,224	46,061	84,665	333,368
From United States	325,088	335,881	1,744,909	1,512,078	2,385,003
From Other Countries	6,973	3,530	6,825	12,948	86,760
Total Value of Soaps, Perfumery and Toilet Preparations:—					
From United Kingdom	$ 20,363	24,536	42,284	92,349	113,707
From United States	197,357	171,096	868,469	771,995	1,036,322
From Other Countries	27,190	101,103	71,980	170,839	410,197
Alum in Bulk:—					
United Kingdom	.....	.....	.....	5,026	31,344
United States	.....	.....	.....	35,119	58,825
Alum Cake:—					
United Kingdom	.....	.....	.....	220	1,138
United States	.....	.....	.....	126,411	177,334
Copper Sulphate:—					
United Kingdom	.....	.....	.....	.....	33,420
United States	.....	.....	.....	.....	52,402
Iodine, Crude:—					
United Kingdom	.....	.....	.....	.....	27,401
United States	.....	.....	.....	.....	1,158
Calcium Chloride:—					
United States	.....	.....	.....	.....	25,684
Chloride of Lime:—(25 lb. packages and up).					
United Kingdom	.....	.....	.....	.....	11,512
United States	.....	.....	.....	.....	515,642
Magnesia:—					
United Kingdom	.....	.....	.....	.....	13,428
United States	.....	.....	.....	.....	27,311
Magnesium Sulphate:—					
United Kingdom	.....	.....	.....	.....	7,019
United States	.....	.....	.....	.....	39,952
Soda, Caustic:—(25 lb. packages and up).					
United States	.....	.....	.....	.....	185,889
Cyanides for Mining Operations:—					
United Kingdom	.....	.....	.....	.....	146,377
United States	.....	.....	.....	.....	25,088
Totals for Chemicals and Allied Products:—					
From United Kingdom	$ 277,352	$ 544,459	$ 1,423,397	$ 1,621,461	$ 3,553,927
From United States	2,018,093	3,013,431	15,725,473	9,658,570	16,379,013
From Other Countries	159,723	387,870	1,081,911	672,484	1,694,051
Grand Total:—	$2,455,168	$3,945,760	$18,230,781	$11,952,515	$21,626,991

This summary does not include such items as Sulphur, of which an amount valued at $1,102,614 was imported during above period.

Against these imports, the total Exports of similar chemical products from Canada amounted to $11,099,924, for six months covered, 1920, of which amount $5,676,234, went to the United States.

BAKING POWDER AND FLAVORING EXTRACTS.

A preliminary report in the baking powder and flavoring extract industry in Canada for the year 1919 has been completed by the Dominion Bureau of Statistics, Ottawa, covering 24 plants, of which 11 were in Quebec, 10 in Ontario, 2 in Nova Scotia and 1 in Manitoba. The total capital invested in the industry was $2,259,753. The quantity and cost value delivered at the works of some of the more important of the materials used by the industry during the year was: Soda bicarbonate, 1,105,461 pounds, valued at $23,131; sulphate of ammonia, 28, 590 pounds, valued at $1,304; cream of tartar crystals, 8,768 pounds, valued at $6,710; coffee beans, green, 926,712 pounds, valued at $185,693; essential oils, 21,647 pounds, valued at $76,547; alcohol, 21,179 gallons, valued at $92,602; sugar, 1,406,767 pounds, valued at $124,477; starch and glucose, 364,290 pounds, valued at $22,973; phosphates, 70,568 pounds, 364,290 at $12,037. The total cost of all materials used was $1,800,801. The quantity and selling value at the factory of the more important products during the year were: baking powder, 4,235,001 pounds, valued at $942,874; coffee, 932,457 pounds, valued at $199,852; flavoring extracts and essences, 204,692 dozen, valued at $310,242; jelly powders, 17,965 cases, value dat $82,256; yeast cakes, 332,333 cases, valued at $430,270; lye, 27,915 cases, valued at $180,513; caustic soda, 488,025 pounds, valued at $38,007. The total value of all production at factory prices was $3,153,706.

Corresponding figures for the coffee and spice industry of the Dominion for 1919 show a total investment of capital in this industry of $5,614,866. The total cost of materials used was $6,258,527, of which $2,260,146 was for 12,709,918 pounds of green coffee beans; $700,502 for 2,532,850 pounds of spice materials; $332,232 for $,167,482 pounds of baking powder materials; cocoa beans, $150,796; alcohol, $112,849; phosphates, 490,930 pounds, valued at $52,881. The total value of the production of the industry was $8,517,581, the principal items being coffee, 10,795,411 pounds, valued at $53,410,012; spices, 3,266,548 pounds, valued at $1,173,915; cocoa and chocolate, 871,625 pounds, valued at $267,561.

MINING IN QUEBEC PROVINCE.

Just at present, metal mining in Quebec is quiet, the only mine in operation being the Weedon, at Weedon, north of Sherbrooke, where a deposit of copper-bearing pyrite is being worked. Operations will be resumed shortly at the Montauban mine of the Zinc Company, Limited, at Notre Dame des Agnes, where mining had been suspended in order to push forward the diamond-drilling exploration.

Quarrying and brick-making are very active, operations being limited only by a shortage of labor. The shortage of coal for the kilns has also hindered the production of lime, which has been felt by the pulp mills, which use large quantities of lime. The output of one of the largest lime companies in the province is practically all taken by the pulp mills.

Mr. Theo. C. Denis, in a recent C.M.I. Bulletin, states that the Consolidated Asbestos Company, which took over the properties formerly controlled by the Jacobs Asbestos Mining Company, are hastening the underground development work on the second level to begin mining as soon as possible. Hoisting from the first level is proceeding. The underground development work at this mine has a total length of nearly three miles. Mr. Denis also reports that the Reed property, near Black Lake, has been leased to the Maple Leaf Asbestos Company, in which the Wiser interests, of Prescott, Ont., have a controlling share, and that plans are being made to remodel the small mill built about a year ago by Messrs. Blais and Fillion, previous lessees.

X-RAYS AND ELECTRO-MEDICAL APPARATUS.

A report recently issued by the Department of Overseas Trade, Toronto, makes note of the advances that have been made in the use of X-rays and electricity in medical practice and surgery, largely through work carried on by the Medical Services during the war. The first examination for the diploma in radiology and electrology, which has been established at the University of Cambridge, was held this year. This development in the use of electricity in medicine demonstrates that there will be in the future an increased demand for such apparatus.

JAPANESE OBJECT TO IMPORTATION OF GERMAN DYES.

"The Weekly Druggist," of Tokio, Japan, in a recent issue states that the proposed distribution of German dyes and drugs in lieu of the indemnity does not seem to be very well received by the Japanese concerned. The Japanese Foreign Office recently addressed inquiries to the various Home Departments to ascertain their views on the matter, and the reply of the Japanese Home Office was that since nothing was known as to the variety of drugs to be distributed, the importing of these German dyes and drugs was apt to offend the feelings of the drug merchants and manufacturers should the Japanese Government agree to the distribution of them without knowing the necessary particulars. The Pharmaceutical Department of the College of Medicine of the Imperial University of Japan replied that there was no necessity at present to obtain the distribution of drugs from Germany. The effect of bringing these drugs into an already depressed market is also emphasized by Mr. Noda, Chief of the Medical Department of the Home Office. The result of these objections has been that the first offer of German drugs in lieu of a cash indemnity has been declined, and the prevailing opinion is that a second offer, which may be made soon, will also be declined.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals in 1920.

Review of Chemical Markets During 1920.

Up to the months of September and October the chemical market had maintained the condition referred to as a "sellers' market," but late in the summer the situation showed signs of change and now, the indications are practically reversed and the general tendency is to assume the character of a "buyers' market."

During the year the market has been affected by several disturbing factors. 1, Labour troubles; 2, Increase in wage lists; 3, Transportation.

The unauthorized or outlaw strike of yardmen and the steel strike in the United States led to such a dislocation of railroad traffic that the priority schedules of wartime were reimposed.

The heavy chemical trade was very hard hit. Labour conditions in the salt mines led to a restricted output on the part of the miners and this was reflected in the price of muriatic acid, and that one time waste product salt cake now in demand in the sulphate pulp industry.

The protracted summer and mild fall, coupled with the advent of prohibition and higher spending ability of the younger members of the community no doubt was responsible for the heavy demand for gray salt in the making of ice cream. This, kept the market stiff for muriatic acid, chlorine and soda salts.

The chlorine group suffered in every way. Freight conditions tied up lime for bleaching powder. The steel strike prevented the making of steel plate for drums and when plate was available transport was paralyzed.

Bleaching powder in spot lots reached as high as eight cents in New York. Pigments and heavy silk chemicals

used as fillers in rubber and paper industries had a troubled season chiefly on account of transportation difficulties.

The change in the character of the market was brought about chiefly through accumulation of stocks, partly as a result of lack of transportation and partly due to a holding back of buyers.

Comparative study of the Canadian and United States markets is difficult as prices in the latter case are chiefly those of manufacturers, while in the former they represent wholesalers' prices to consumer, after paying duty, freight and exchange, so that the Canadian market lags considerably. Increased Canadian output of soda ash and sulphuric acid is assured for 1921, while considerable interest attaches to the development of the plant at Trenton, and to the increased activity in fertilizer chemicals. Fertilizers, sprays and insecticides are not only important in conservation and cultivation but their increased use should bring about development of several of our natural resources.

A concrete instance of this is arsenic, which has been found not only useful as a spray, but also as a soil treatment. A broader handling of the industrial alcohol question by the Government is in evidence and should result in a widening of the pharmaceutical, perfumery, and extract trade in Canada. On the whole it looks as if more stable conditions could be expected, and it appears that the Canadian Chemical Industry is entering a field of greater independence.

Chemicals.

December has opened with the chemical and drug market in somewhat better condition than that prevailing throughout November. There is a decided opinion among many dealers, both at Montreal and Toronto that prices have reached their lowest level. There may yet be some falling off in some lines, but business has picked up over last month and that alone is encouraging. One thing is certain, conditions are much worse on the American market where the large number of re-sellers effect the market considerably.

Sulphuric Acid—Sulphuric prices have dropped a quarter of a cent a pound. The new plant at Trenton, Ont., is now producing, and it is reported the product is finding a good demand, especially on future business.

Bleaching Powder.—Bleach is still scarce but somewhat easier than during November. Quotations run around .06½ cents per pound per cwt. for present delivery, though lower prices are quoted on future supply.

Alcohol.—Wood alcohol has declined, quotations as of Dec. 1st being $2.50 per gallon for barrels or over. Business is better than last month, and no further reductions of any great amount may be expected.

Pharmaceuticals.—With the exception of the bromides, which have suffered another slump, drugs are holding about the same as last month. No advances are quoted.

Rubber Situation.—The rubber industry in Canada, as in the United States and England, is, as most market people now know, suffering from depression. The rubber market in England is facing a serious crisis. The November settlement is tided over without trouble, but there is fear of a crash daily in the raw stock market, owing to the continued absence of any American demand for rubber. The curtailment of production by 25 per cent. has not remedied the situation, and there is now talk of English plants completely ceasing production until the surplus stocks are absorbed.

While there is no immediate sign of any pick-up on the rubber market, some Canadian manufacturers are of the opinion that toward the middle or end of January, business will commence to return. It is the dullness in the automobile business that has knocked the rubber industry and market into depression, and it can readily be seen that not until money is a whole lot easier, so that car purchases will resume, will there be much activity in the rubber market.

Oils.

In connection with the finding of oil 45 miles below Fort Norman, near the Mackenzie River, and 150 miles south of the Arctic Circle, by drillers of the Imperial Oil Company, we mentioned in our November market report the great problem involved in bringing the oil, should it prove to be there in commercial quantity, to the nearest railway line. We quote here from the only official statement made by President Stillman of the Imperial Oil Company in connection with the discovery:

"On the 25th of August, at a depth of 783 feet, oil was encountered, which flowed out of the six inch pipe for thirty minutes, when the well was capped and shut in. Any estimate as to the amount of oil this well would produce is only a guess, as there was no tankage and, therefore, an accurate test could not be made.

"We consider this an important strike, and scientifically of much value. From a commercial point of view, however, it is not of immediate value, as it will probably be years before it can be made available in quantities for the use of the Canadian market, on account of its remoteness from any refinery outlet. This well is situated 45 miles below Fort Norman; 900 miles from the nearest calling point of a river boat; 1,200 miles from the nearest railroad, and 1,500 miles north of Edmonton, the nearest city, via the present route. The only means of access to the location at the present time is down the northern rivers, which will only float boats of four or five foot draught, and several rapids necessitate the unloading and transporting of the cargoes overland and reloading on barges again. This precludes bringing oil up the river in any quantities until more adequate facilities are provided."

President Stillman goes on to state that the laying of a pipe line from the well to the nearest railway, 1,200 miles, would probably cost $50,000,000 in itself, and also points out that the extreme cold of the region is another factor to reckon with, causing the rivers to be navigable for only three or four months of the year. In conclusion, President Stillman states:

"With these facts in mind, it must be realized that to render the oil from this Arctic region commercially accessible would prove very costly, and the problem would require great study before any means can be devised of getting the oil out to compete with crudes from other centres of production."

Turpentine.—A lack of demand, together with a splendid crop in the South, accounts for the drop in turpentine price. A Canadian oil man recently returned from a trip to the South reports that many producers are tapping the trees on three sides so good is the run, whereas usually tapping is done on only one side.

Linseed.—Linseed oil has reached lower levels than it has since pre-war days. Quotations at Toronto and Montreal bring around $1.10 per gallon. Compared with war time prices this figure is indeed low, as a glance at back issues will show. Two years ago Canadian farm-

ers were getting $5.00 per bushel for flax seed, but this fall $2.00 is the price received. At this figure there is certainly not very much profit for the farmer, as flax seed crops only run from three to nine bushels per acre, nine being a very excellent yield not often attainable. When compared with wheat yield, it can readily be seen that there is not a great deal of encouragement for the growing of flax. There is a bumper flax crop in Argentina, and Canada has produced from seven to eight million bushels this year, which is a fine crop; while the United States also has a good one of about eleven million bushels.

Crude Oils.—Crude oil remains firm for both mid-Continent and Pennsylvania. There is not any prospect of a decline in crude prices, with the exception of the poorer grades, which may possibly shade off some, though they are not a real factor on the market in any case. The situation in the oil market to-day is one of lack of production, not from refineries, for they are working steadily, but new fields must be found. This lack of production, causing shortage of supply to meet the demand, has been the reason for the C.P.R. reverting their oil burning locomotives and steamboats back to coal, according to an announcement made by the C.P.R. on November 27th last. The C.P.R. was supplied not from Canadian companies, but from the Union Oil Company of the United States, and consumed 70,000 barrels daily. It is estimated that the change will cost close to $60,000 for each steamer and $12,000 for each locomotive.

Metals.

The prevailing low price of copper is the feature of the metal market. Demand is poor and the result has been the closing down of two of the copper mining mills in British Columbia, details of which will be found in our British Columbia metallurgical news in this issue. A fair business is being done by iron and steel warehouses at Toronto and Montreal. Quotations on steel sheets have declined a little due to resales from manufacturers who have stocks on hand of high-price material and who are apparently selling these at a lower figure, so that they may restock at a better figure.

Attention has been drawn during the past few weeks to the fact that American mining engineers have been busy investigating the possibilities of obtaining arsenic in the mispickel ores of Hastings County, Ontario. These engineers have pronounced these deposits to be the largest in the world, and as American companies now buy up practically all the arsenic obtained from the Cobalt, Ontario, ores, it would not seem surprising to see an American concern formed to develop the Hastings deposits; another example of the backwardness displayed by Canadians in developing their own resources.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs	6.50— 6.75
Ammonium Bromide	Lb.	.. — .75
Aluminium Sulphate, high grade, bags	100 Lbs.	. — 4.75
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.20— .22
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—45.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	.. —.06½
Borax, crystals	Lb.	.. — .10
Boric Acid, powdered	Lb.	.. — .18
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Lb.	.06½—.07½
Caustic Soda, ground, drums, larger amts.	Lb.	.06—.06½
Calcium Chloride, fused	Per Ton	.. —56.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .14
Carbon tetrachloride, drums	Lb.	.19— .23
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.09¾—.10¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.17— .18
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid. 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.05—.05½
Mag. Sulphate, B.P., Medicinal	Single Ton	95.00—110.00
Mag. Sulphate, B.P., Technical, car lots	Ton	80.00—85.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.09¼—.09½
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .70
Potassium, Bromide, granular	Lb.	.. — .70
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .35
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.38— .40
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.00
Potassium Iodide	Lb.	4.00— 4.25
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.12½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.. — 1.15
Sodium Bicarbonate, 100% pure	100 Lb.	4.00— 4.50
Sodium, Bichromate, bbls.	Lb.	.25— .30
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05¼— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.32— .34
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.75
	Per Cwt. in Car Lots	.. — 2.25
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.40— .45
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.08¼— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.06—.06¼
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.. — .12
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16

Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. — .28
Acetone, pure, lesser amounts	Lb.	.. — .33
Aspirin, in 100-lb. lots	Lb.	1.20— 1.25
Alcohol, acetone, bbls. or over	Gal.	.. — 2.90
Alcohol, acetone, lesser amounts	Gal.	.. — 3.10
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —12.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 2.50
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 2.60
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 2.75
Alcohol, wood, 97%, bbls.	Gal.	.. — 2.60
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 2.70
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.85
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.35
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.80
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	..35— .80
Formaldehyde, bbls. or over	Lb.	.. —.35¾
Formaldehyde, 200-lb. kegs	Lb.	.. —.38¾
Formaldehyde, 100-lb. kegs	Lb.	.. —.39¾
Formaldehyde, 50-lb. kegs	Lb.	.. — .41
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		3.00— 3.50
Oxalic Acid	Lb.	.50— .55
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.75— .80
Stearic Acid, Double Pressed	Lb.	.28— .33
Stearic Acid Triple Pressed	Lb.	.30— .35
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Rubber.

Crude.

Para, upriver	Lb.	.20½— .21
Caucho Ball, upriver	Lb.	.. —.15½

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.19½
Smoked Sheet	Lb.	.. —.17½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .09
Inner tubes, No. 2	Lb.	.. — .06

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.75— .80

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. —.35½
Antimony	Lb.	.. — .09
Brass, yellow ingots	Lb.	.. — .17
Brass, red	Lb.	.. — .20
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.18½
Copper, electrolytic	Lb.	.. —.19½
Copper, electrolytic, in car lots	100 Lb.	.. — .19
Gold, Pure	Oz.	.. —45.00
Iron, Pigs	Ton	.. —60.00
Lead	Lb.	.. —.09½
Lead, in car lots	Lb.	.. — .09
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	..—105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .47
Zinc, sheets	Lb.	.. — .25

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .42
Motor Gasoline (service stations)	Gal.	.. — .45
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .41
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .17
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots..(Imp.)	Gal.	.. — 1.40
Rosin, Grade G, in 280 bbl. lots		.. —14.50
Rosin, Grade W.W., in 280 bbl. lots		.. —15.00

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .28
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	.. — 1.10
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	.. — 1.13
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.00
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Steamed Bone Meal	Per Ton	70.00—75.00
Pure Ground Blood, per unit of Ammonia		.. — 8.00
Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10

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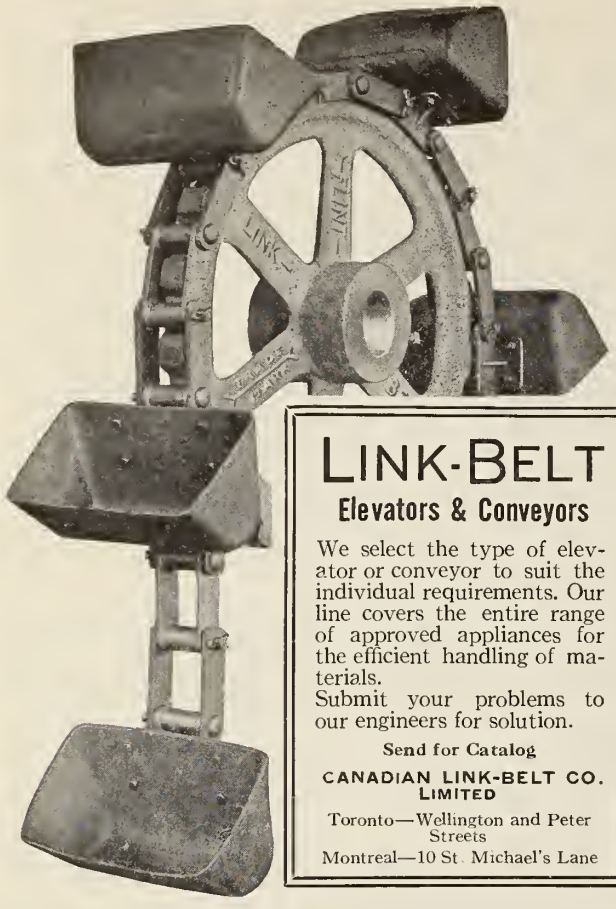

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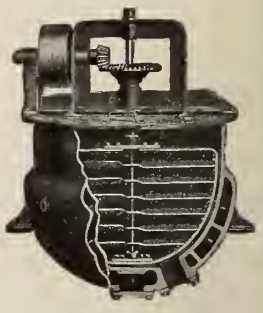

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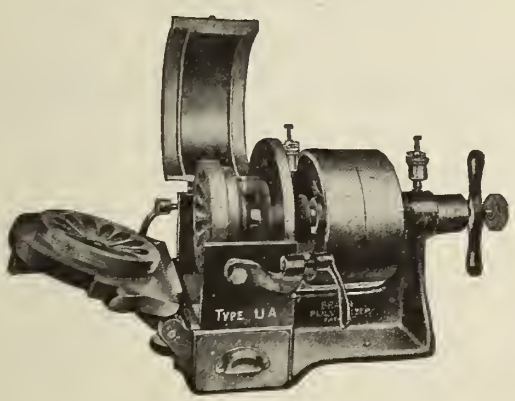

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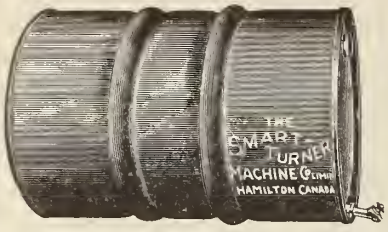

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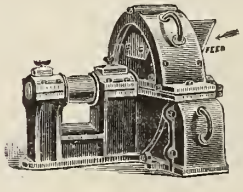

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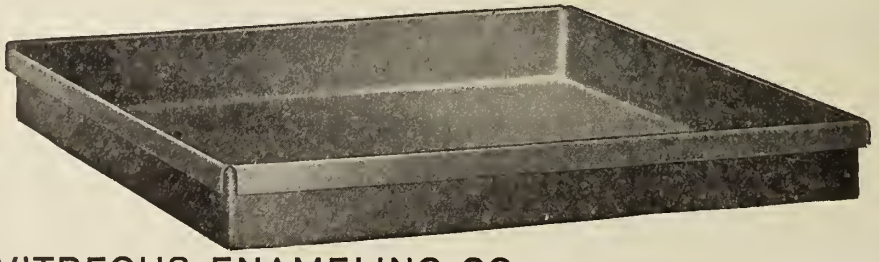

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